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THE

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AN ILLUSTRATED MONTHLY

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THE NATIONAL GEOGRAPHIC MAGAZINE

GEOGRAPHICAL EXPLORATION: ITS MORAL AND MATERIAL RESULTS*

BY GENERAL A. W. GREELY, U. S. A.

CHIEF SIGNAL OFFICER

THE spirit of human endeavor has found few fields more fruitful in sequential results than that of geographical exploration. As far as may be possible, in the brief period allotted for this address, an endeavor will be made to present the more important results, not only as regards its material aspects, but also as connected with its moral tendencies.

The branches of geography now treated are confined to economic, physical, and political phases to the exclusion of bare outlines of land and water distribution and mathematical demonstrations. It is not the mere explorer that engages our attention, but rather the pioneers and settlers, whose close, persistent, practical studies and labors along agricultural, biological, and mineralogical lines have made known the vast resources of the earth for useful exploitation by the masses.

The growth, development, and ultimate limitation of nations are largely influenced if not entirely due to geographical environment. The location of great centers of agriculture and commerce, of special industries, mining and stockraising, is the outcome of careful explorations of the special economic resources on which their success depends.

It is of interest to note that the necessity and beneficence of explorations are set forth in the earliest recorded history. We read in the Old Testament:

"Now the Lord had said to Abraham: Get thee out of thy country, and from thy kindred, and from thy father's house into a land that I will show thee, and I will make thee a great nation, and I will bless thee, and make thy name great."

The prophecy to Abraham outlines the means whereby a great nation was created. Similar results have been not infrequent in the world's history of explorations, whether applied to the Romans, to the Spaniards, or to the Anglo-Saxons. Through such potent

*An address delivered at the Tenth Celebration of Founders' Day at the Carnegie Institute, Pittsburgh, Pa., November 2, 1905.

agency has come the migration of nations; the transfer of power, whether economic, industrial, or political; the development of mankind, and the growth of civilization.

The work of geographical explorations has usually passed through three distinctive phases: First, commercial purposes; second, advancement of knowledge; third, scientific explorations. Prolific as have been the earlier stages, it is the last named which has been the most potent force in the development of America, especially in the past, and which is so rapidly changing Australia and Africa at the present time. All and any of these methods have been, it is believed, fully successful only as far as there have been conjoined therewith moral forces as adjuncts to physical efforts.

In his quaint history of Muscovia, the immortal Milton, passing beyond the common features of geography—as to mountains and rivers, as to longitudes and latitudes—argued that its higher scope included broad phases of earth conditions and human relations well suited for the efforts of a learned and judicious mind. It is notable that with his high ideals the blind poet, clearly discerning moral relations, sharply discriminated between exploration for gain and that for nobler purposes.

Following afar this great master of English speech and forceful fashioner of human thought, it is well to make clear the essential points.

As material results are classed those where the outcome is mainly pecuniary and physical, most frequently in the form of commercial or industrial exploitation, in mining gold, silver, or copper, etc. The moral results are associated with the generous assimilation and liberal development of discovered regions, under conditions whereby the civilized world benefits in the aggregate, and primitive folk are raised higher in the scale of humanity. In such cases the natural resources of the country and the mental activities of the people are made to increasingly subserve the new regions involved and by reaction similarly improve the rest of the world. Intelligence, justice, temperance, tolerance, fair dealing, and educative methods along the higher moralities are essential qualities of the true explorer. Their practical and successful application is an important factor in the evolution from uncivilized materials of a modern state, so as to justify its admission to international comity.

We will now consider failures, satisfactory results, and striking successes, especially along moral lines.

THE POLO BROTHERS

Probably the greatest failure to utilize geographical exploration of an epoch-making character is that associated with the journeys of the Polo brothers. Not only did material interests suffer from closing for five centuries and more commercial traffic across densely poplated Asia from the Mediterranean to the China Sea, but its high moral possibilities were absolutely neglected. The three Venetians, through years of service, attained great power and influence at the court of Kublai Khan, the great emperor of China. Inspired with a desire to displace Confucianism, Kublai Khan commissioned, on their departure, the Polos as messengers to ask the Pope to send missionaries to his people. Ecclesiastical quarrels then engrossed all Christendom, the Grand Lama intervened with Buddhism, and later Islamitic proselytism closed China to western influence for centuries. It bewilders one to imagine the potent changes which six centuries of Christianity as a state religion might have wrought in the Chinese Empire.

THE EARLY DUTCH EXPLORERS

During the sixteenth century the Dutch were scarcely second to Spain in their geographical explorations, which were so successfully pursued that some of the richest and most populous lands fell under their sway. Commercial exploitation, pure and simple, was the Dutch policy. Of all peoples they stood for political and religious freedom, making therefor sacrifices of life and treasure scarcely surpassed in the history of the world. The Dutch have given unusual care to the technical training of their civil servants, but do not appear to have displayed an equal religious solicitude for their colonies and for domestic affairs. In dealing with Java they have ignored the higher moral questions and adopted restrictive policies, thus failing to make Dutch East Indies an important factor in the world. Measured by the high ideals of this century, the moral results are meager and unsatisfactory, though Netherlands yet controls the Javan Archipelago and its thirty millions of natives.

THE GLORIOUS GEOGRAPHICAL HISTORY OF SPAIN

Marked though it has been by faults largely those of the ages, the geographical history of Spain is glorious to the highest degree, whether measured by its material or moral results. With the discoveries of Columbus and the world circumnavigation of Magellan, modern geography was born. Indefatigable in purpose, unsurpassed in bravery, unyielding in religion, but deferential to racial prejudices, gracious in manner, and courteous in speech, Spanish explorers made an indelible impress from one end of the earth to the other. In the Antilles or South America, in Mexico or the Philippines, they thoroughly implanted their customs and ideals, their administration and religion, their laws and language. The Spanish civil law, whose first Mexican code antedated by half a century any English settlement in the United States, is today, in pure or modified form, second as to area and population only to English law, while the melodious language of Spain is the daily speech of nearly triple its home population. In the aggregate the Spanish explorer, by extending the sway of law over, and instilling Christianity into the hearts of the natives of new lands, has exerted a more potent moral influence than has any other nationality.

Of all explorations none appeared at the time richer than those of Portugal, from Prince Henry, the Navigator, to Diaz and Vasco de Gama; yet they were morally perverted. The coasts of Africa were circumnavigated and exploited and the trade of India made attainable by sea. Pope Alexander the VI, by the famous demarcation bull of May 4, 1493, confirmed the possession of the eastern half of the newly discovered world to Portugal, which at once rose to commercial supremacy and the height of its material glory. But traffic was the sole aim, and the African slave trade a most essential factor in its profits. During four centuries Portugal was distinctly foremost in this human traffic, which by its horrors and immoralities has not alone outraged the spirit of Christianity, but has also, particularly in America, produced conditions vexatious and portentous to an alarming degree.

DAVID LIVINGSTONE AND STANLEY AFRICANUS

Let us turn to a brighter phase of African history, wherein the geographical explorations of a single man, David Livingstone, produced moral results of the highest value. In golden words Stanley pointed out that the track of Livingstone's explorations

form on the map of Africa the shape of our Saviour's cross.

In these journeys Livingstone impressed the spirit of that symbol on the people of Africa, and, ever scattering the words of the Master and patterning his life thereafter, exerted an unsurpassed moral influence on hundreds of thousands of men, and so made the first rift in the ignorant barbarism of a Dark Continent.

The black slab in Westminster Abbey recites the heroic story:

"For thirty years his life was spent in an unwearied effort to evangelize the native races, to explore the undiscovered secrets, and abolish the desolating slave trade of Central Africa."

Of Stanley Africanus, as I call him, his African explorations in their potentialities are second alone to those of Columbus. From Stanley's labors have come wondrous results; commerce and religion form beneficent settlements; slavery disappears gradually; inter-tribal wars cease; industries spring up, and there is peacefully organized a vast tropical empire, the Congo Free State, "a civilizing center in the heart of Africa," potential in its possibilities of moral and material development.

THE COMMERCIAL PROFIT FROM ARCTIC EXPLORATION

I have been asked to say a few words regarding the scope and results of Arctic explorations, to which many attach a moral value, while mistakingly, at least as to its past, considering it to be pecuniarily unprofitable. In material results the aggregate value exceeds twelve hundred millions of dollars. Most important are the American whale fisheries, three hundred and thirty-two millions from 1804 to 1876, and the Dutch fishery, 1677 to 1778, over one hundred millions. In lesser order of values follow the British fishery, the fur trade of northeastern Siberia, the fossil ivory of the new Siberian Islands, and the Alaskan seal and fur products.

Turning to the interrelated moral and material outcome, may be cited the northeastern Arctic voyage of Chancellor, who set out, to quote Hakluyt:

"Either to bring that to pass which was intended, or to die the death."

Of this expedition Milton wrote:

"The discovery of Russia by the Northern Ocean might have seemed an enterprise almost heroic if any higher end than excessive love of gain and traffic had animated the design."

THE GREELY EXPLORATIONS

There was, however, a moral result not foreseen by Milton. It is not alone that this exploration was the beginning of England's mighty maritime power and her commercial supremacy, it initiated the freedom of the seas as highways, it strengthened international comity, then in its infancy, it cultivated the spirit of patriotism and elevated the sense of national self-respect.

I speak hesitatingly of my own Arctic work, which was primarily devoted to scientific observations, being one of the fourteen international stations occupied from 1881 to 1883. In field work it added 6,000 square miles to our knowledge, and took the honors of the Farthest North, held for three hundred continuous years by England.

Retreating 400 miles south in 1883, according to orders, we wintered at Cape Sabine, where shipwreck and mismanagement of the home authorities left the party without supplies. In 1884 the seven remaining men were rescued by the relief expedition of our navy.

Of the work and the men I can say nothing new, in this twenty-fifth year since the inception of the Lady Franklin Bay expedition. By arduous labor, heroic endurance and unflinching fortitude they advanced our national ensign to an unparalleled latitude on both

sea and land; they carried out fully the international program of scientific observations, increasing largely our knowledge of the physics of Arctic regions; by a boat voyage of hundreds of miles they brought through a dense polar icepack their complete records, at the price of bodily suffering and diminished chances of life. Finally they so comported themselves that under most untoward, prolonged and desperate circumstances, their courage, discipline and subordination were almost invariably maintained. As a result the unity of the command continued through nine months of continuous hunger, and five months of polar cold and Arctic darkness. Such moral qualities are the bases of fidelity and honor, so that perhaps it is not too much to say that the work they wrought, the courage and devotion they showed, may long live in the memories of men.

RECENT GEOGRAPHICAL PROBLEMS

It is needless to here outline the explorations by English, French, and Americans, which have led to the evolution of civilization in North America. They are well known parts of our history. Cartier, Hudson, Champlain, Allouez, Joliet, Marquette, Iberville, La Salle, Tonti, Hennepin, Carver, Gray, Mackenzie, Lewis, Clark, Pike, Long, and others were the pioneers.

The material results on the continents of America alone are so vast as to defy summary. Suffice it to say that they now involve twenty-two nations, 150,000,000 population, and various forms of wealth that aggregate many billions of dollars.

In the last half century other geographical problems have been settled with constantly increasing efficiency by Canadian and American scientists. Their explorations are not alone in finding agricultural, forestal and mineral resources, but also in connection with the characteristics of plant and animal life, together with the properties of climate and soil affecting their competitive life-struggles and successful evolution.

That the moral results of political geography are keeping pace with material advancement, and that there are corresponding uplifts in the life of the masses yearly entering our national domain, I cannot clearly discern though looking optimistically to the future.

Marked though the phases of geographic evolution have often been in America by disregard of the rights of aboriginal tribes and at the expense of their development, yet the final outcome has been for the benefit of mankind in general. This is especially true as to the spirit of individual freedom, which, crossing the Atlantic and permeating the despotic strongholds, today re-echoes and chronicles joyfully the birth of a new nation—Russia—self-assertive, intensely violent, but ultimately to be self-respecting and self-governing.

THE FLORIDA KEYS

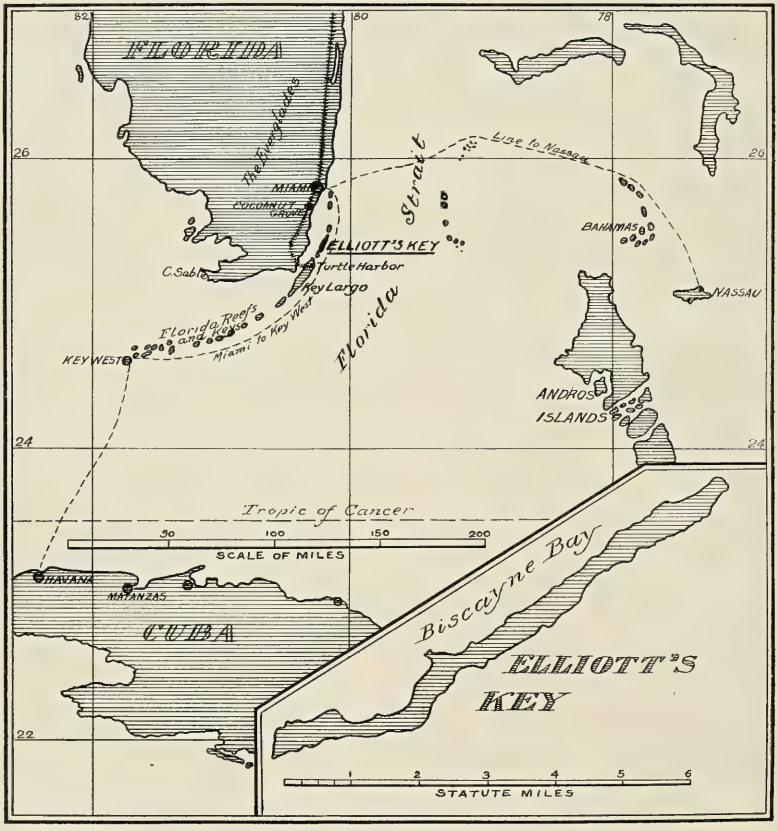
By John Gifford

EXCLUDING of course our distant tropical island possessions, there are three tropical regions in the United States. One is along the Colorado River, in the neighborhood of Yuma; another is the southernmost part of Texas, near the mouth of the Rio Grande, and the other, which is by far the most extensive and attractive, is the southernmost part of the peninsula of Florida.

Florida, like a great finger fully 400

miles in length, points to the fertile regions beyond which are awaiting American capital and enterprise.

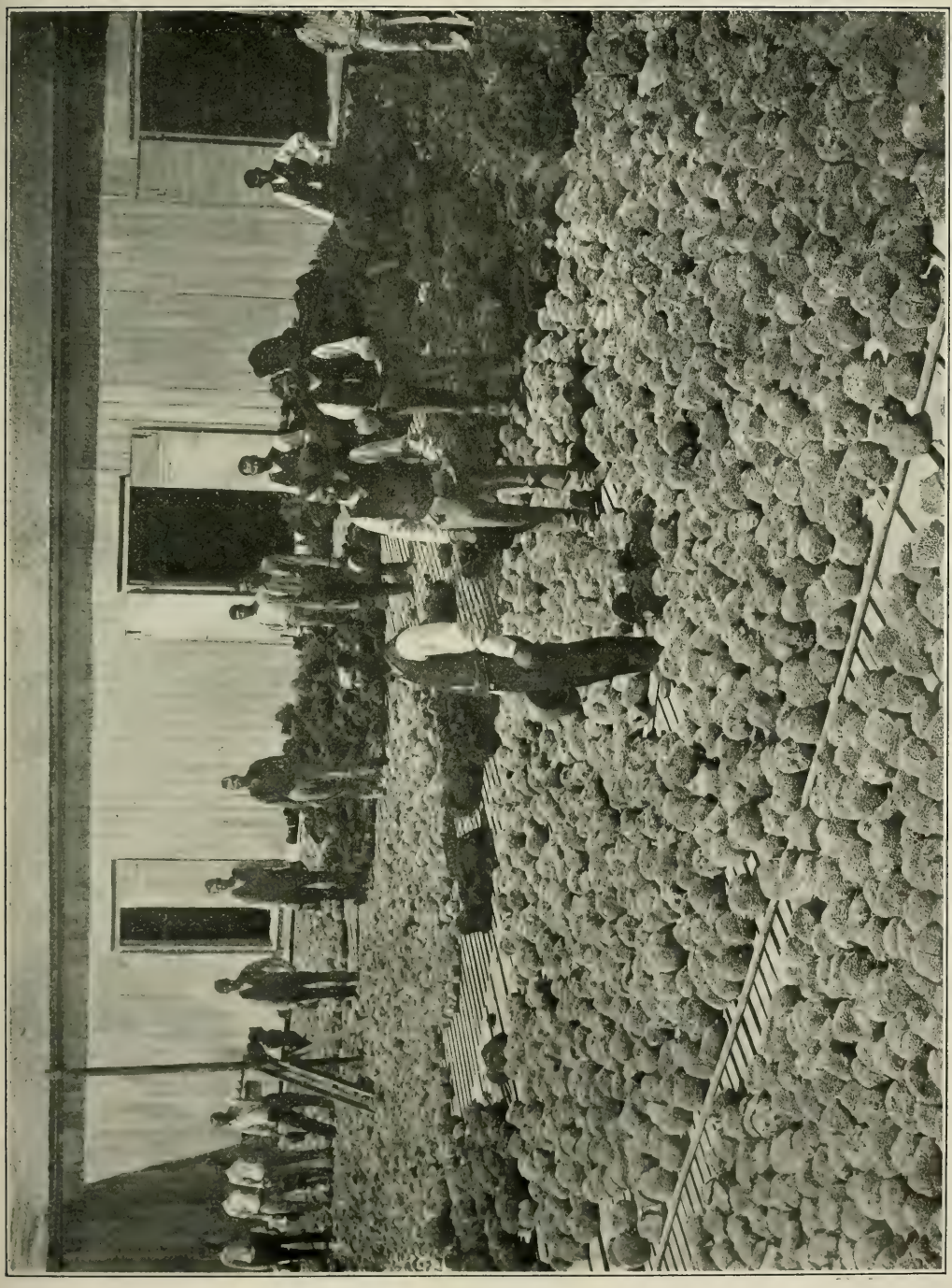
Of this extensive part of Florida, most of which is till unreclaimed and even unexplored, the islands or keys which extend from the neighborhood of Miami in a curved line southwestward to and beyond Key West are the most tropical and attractive.



Map of South Florida

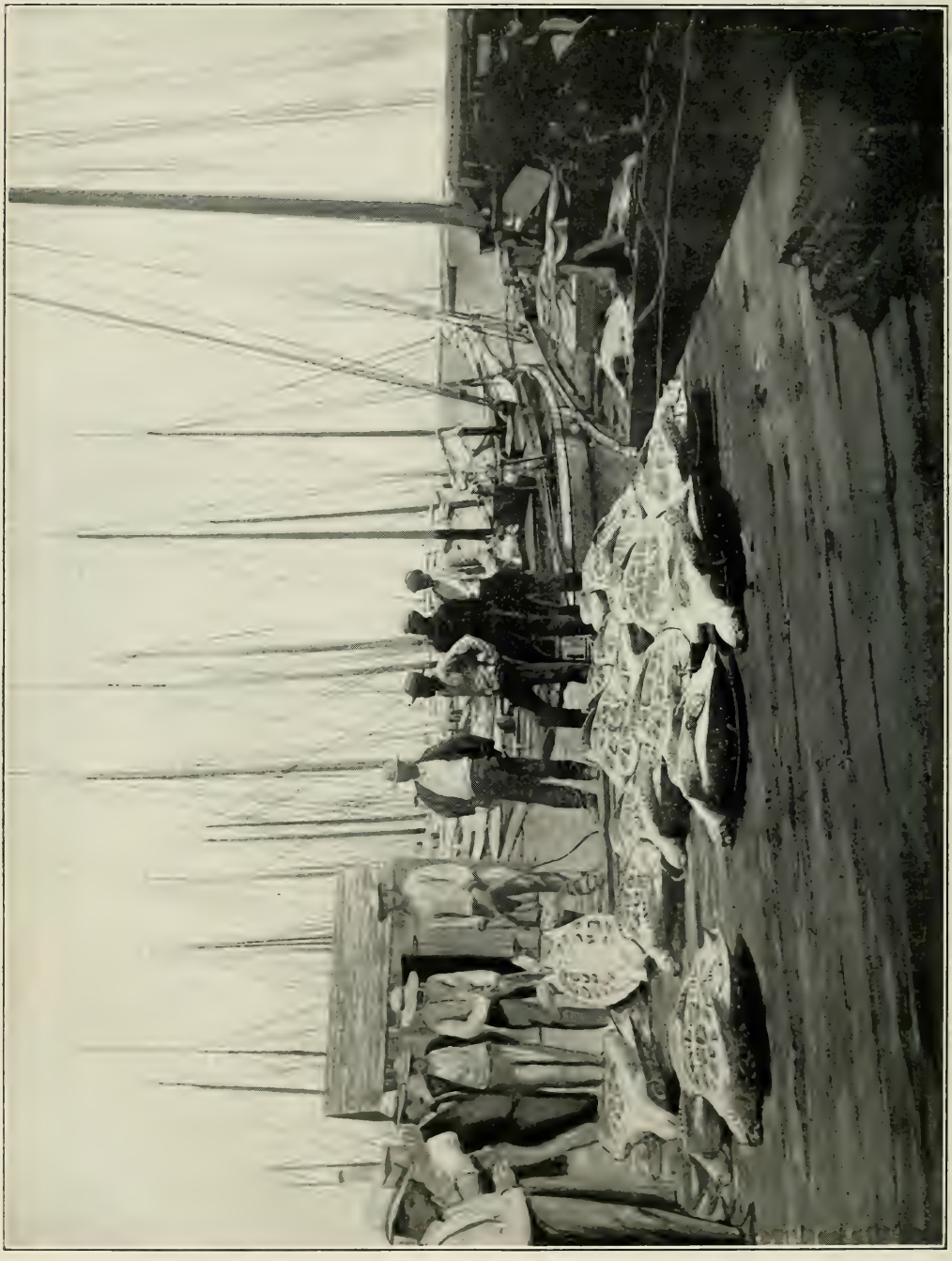
The extent and possibilities of tropical Florida are only realized by those who have spent much time and effort in its exploration. If the island of Porto Rico were to be placed over the Everglades, much land would still be left around the edges. To find a beautiful grove of royal palms on the southern edge of these Everglades is a sample of the kind of surprises one is liable to meet with in this peculiar country.

It is of interest to note that on a journey from New York to the Florida keys by rail one is only two-thirds of the distance when he reaches Jacksonville. It is of interest to note also that this comparatively small patch of land in south Florida is the only truly tropical land which can be reached by rail easily and quickly from the eastern part of the United States. It is indeed



From John Gifford

Sponges Drying on the Wharf at Key West



From John Gifford

Green Turtle on the Wharf at Key West

a wonder that when cold weather comes this region is not completely overrun with people. The Florida keys are so peculiar and different in every way from any other part of the United States that the traveler who has never been there may rest assured that there is still one novel and enjoyable experience in store for him.

These little islands or keys set in waters of many colors, about which cluster legends of pirates, wrecks, and treasures, will soon be closely linked together by the railroad now in process of construction. They will soon no doubt be as thickly populated and as carefully cultivated as are the Bermudas. Although these keys have been more or less cultivated for many years and have produced enormous quantities of pine-apples, limes, bananas, and other fruits and vegetables, the natives or "Conchs," as they are called, who came from England via the Bahamas, have devoted themselves mainly to wrecking, sponging, and fishing.

There are at least 50 of these islands or keys which are inhabitable and productive, and hundreds, perhaps thousands, of smaller ones of little or no value at present, but which may some day be elevated and improved. These keys extend a distance of 165 miles from Miami to Key West. Twenty miles farther to the west are the Marquesas keys, and still 50 miles farther are the Dry Tortugas. Sand Key, a small island south of Key West, on which a light-house is located, is the most southern point in the United States. Key West is about 100 miles from Havana, while Miami is about half that distance from the Biminis Islands of the Bahamas, the nearest foreign territory. Key West has long been recognized as an important military and naval as well as commercial base.

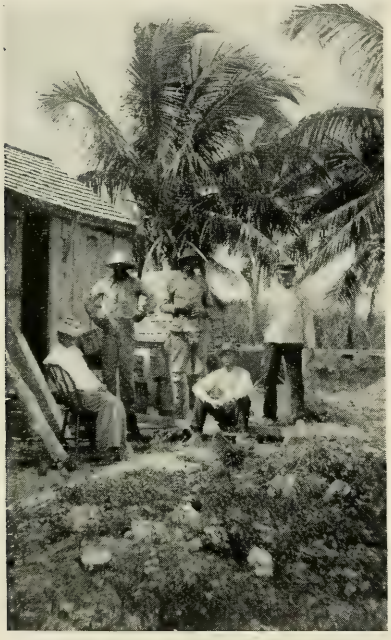
Key Largo is the largest of the keys. It is 30 miles long and varies from about a quarter of a mile to two miles in width. The post-office on this key is located at a small Conch settlement called Planter.

The railroad after leaving Miami, which has been for several years the terminus connecting with boats for Key West and Havana and Nassau, passes through rocky, pine-covered land, through dense tropical hammocks, through everglades and muddy mangrove swamps across a tongue of land or mangrove-covered mud to Key Largo. The railroad is now in process of construction on this key. It passes down the center of the island through a thick tropical jungle or hammock, where mahogany is as common as maple in New York, by fields of pine-apples and groves of limes, and by the houses of the natives, which are located on the ocean side and are surrounded by cocoanut palms, sapodilla trees, sugar apples, bananas, and other tropical fruits and vegetables.

In passing from key to key, this interesting railroad will probably cross as much water as it does land. There will be miles of bridges and many draws, because the creeks separating these keys are in several instances wide and much used by sponging, fishing, and pleasure craft. The road must be high to escape the waves, and the journey from Key Largo to Key West, a distance of over 100 miles, will be like a trip at sea, with the broad Gulf of Mexico on one side and the straits of Florida on the other. In spite of water and mud, stiff currents, storms, dense jungles, rough coral rock, and millions of mosquitoes, the work is being pushed. To one who is familiar with the region it appears an impossible task; but money and engineering skill accomplish wonders, and already machinery, barges, house-boats, water-boats, tons of cement, timber, laborers, mosquito-netting, and insect powders

are being rushed to the scene of action. That this road is to be built quickly there can be no doubt. Hustling in the close jungle in the summer time in the midst of clouds of pungent smoke from the burning hardwoods to keep the mosquitoes from devouring one alive is not an enviable job.

In not more than five and probably not less than three years Key West will be the most southern railroad terminus in the United States. With a deep harbor it will soon develop into



"On Elliott's Key"

a metropolis of great importance from many standpoints. The time to Havana, Panama, and Central America and Mexican ports will be considerably shortened and many Spanish-American buyers who now go to Havana will come to Key West, and northern firms will establish there offices and showrooms and warehouses to meet this trade. It is already the center of a big cigar business, with a pay-roll of $40,000 a week, every cent of which is soon put into circulation again. It is the center of our sponge industry, which employs a fleet of 150 vessels. It is a point of call for many passing ships, and besides the regular steamship lines which stop there, sailships run to the Bahamas, Cuba, Bonaca, Caymen, and to other out-of-the-way places. It is a place where many ships come to be repaired and where the affairs of many ships which are wrecked upon these dangerous reefs are finally adjusted. It is a dirty, unattractive city with a large proportion of negroes and Cubans in a population of about 20,000. It is said by those who are well informed that this island of about 1,000 acres will have a population of over 100,000 in less than ten years.

There are no roads on these keys. People visit and go to school and church in boats. Although these people are very pious, church is postponed if a wreck is on.

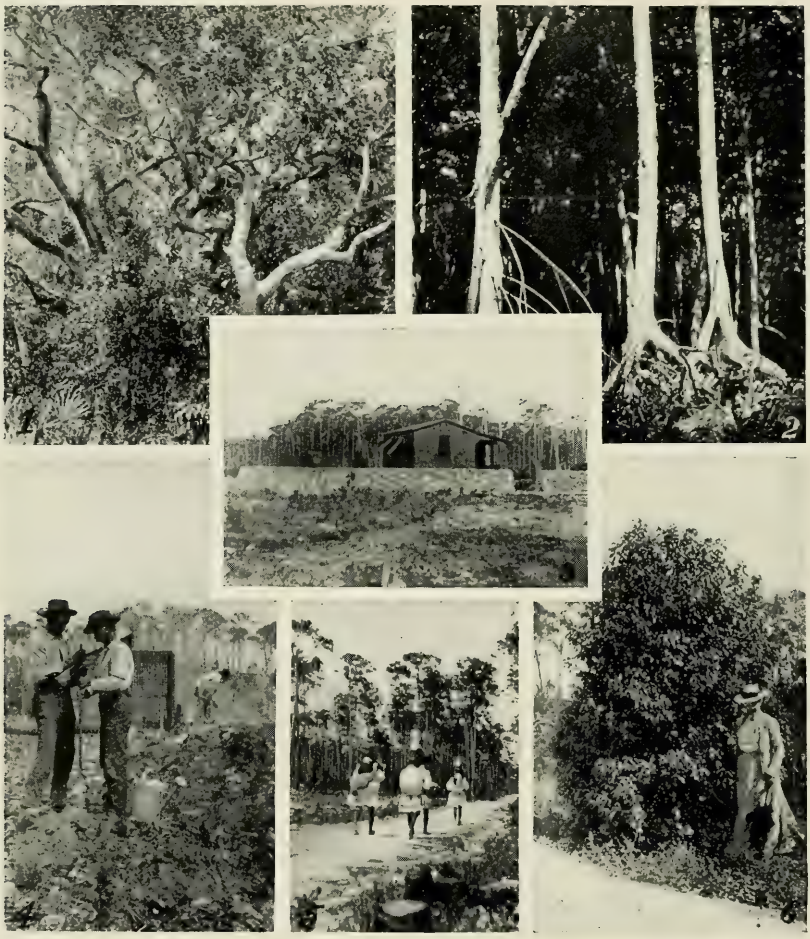
When there is nothing doing on the sea they cut the hardwood timber on a patch of land and burn it. In the ashes they plant pine-apples. No fertilizer is used, and after a few years the field is abandoned and allowed to come again in forest.

The soil is mostly solid coral rock, in places broken, and in the hollows there are patches of rich red soil and humus, in which bananas and vegetables grow with great luxuriance in mid winter. There are many fruits, but the one the Conch loves best is the sapodilla. This tree grows almost wild and bears an enormous amount of fruit. From the juice of the green fruits of this tree "chicle gum," the basis of chewing gum, is manufactured and shipped in immense quantities to this country from Mexico. The Conchs call this fruit "dilly" for short. In the woods there is a so-called "wild dilly,"

The Grape Fruit or Pomelo

There are extensive lime groves on the keys. On this stock the Pomelo thrives

a close relative to the famous South American tree which yields the valuable balata gum of commerce. It is here where vanilla will grow and perhaps coffee and many other tropical things which have never been tried. On his plantation on Elliott's Key the writer has picked in one day cocoanuts, bananas, limes, pine-apples, papaws, sapodillas, sugar apples, sweet potatoes, tomatoes, egg-plants, and peppers.



On the Mainland of Biscayne Bay, at Cocoanut Grove

(1) In the hammock. (2) A mangrove swamp. (3) Shows the character of wall built of coral rock. (4) Drilling a hole in the coral rock to blast a hole for a grape fruit tree. (5) Seminoles coming in from the Glades with venison; shows also a rock road. (6) A thrifty camphor tree.

Old Plantation on Elliott's Key

Along the shore on the ocean side there are coral sand, masses of broken coral fingers, shells, sponges, and the flotsam and jetsam which is carried hundreds of miles from the coasts of South and Central America. Great floating islands from the mouths of tropical rivers are wafted northward by the Gulf Stream. They are broken into bits by its choppy waves and are piled upon the shores of the keys. This flotage, including lumber and wreckage, forms an interesting museum, so that beachcombing is an exciting and often profitable pleasure. The vegetation of this region is like the Bahamas, western Cuba, and the Yucabecan Peninsula. Besides many tropical plants like the cocoanut palm, which encircles the earth, there is the cocobola, pigeon plum, blackwood, fiddlewood, blolly, satinleaf, mastic, red bay, lancewood, ironwood, stopperwoods, nakedwood, cocoaplum, wild tamarind, princewood, gumbo limbo, wild rubber, torchwood, liqnum-vitæ, mahogany, and many other species which are little known.

These islands are not much above sealevel, but are so rocky and solid that one never feels in danger of being washed off. They are protected by a line of reefs which breaks the force of the waves. These reefs come very close to the surface and are exceedingly dangerous. When a ship runs ashore, which happens often in spite of many light-houses and beacons, the Conchs for miles around know of it in a mysteriously short time, and indeed it is a gruesome sight to see a great ocean liner like the *Alicia,* which was wrecked recently, loaded with precious stuff from Bilboa for Havana, hopelessly aground and surrounded by a solid mass of white-winged wreckers. In the early days it was loot and lark; today it is somewhat organized and regulated. Between the reefs and keys there is a stretch of water called the Hawk Channel. This is the most ideal sailing ground imaginable. Usually a brisk wind blows, the sea is seldom rough, the water is of every color and teeming with life, and here and there are sea gardens of wonderful beauty and interest. If one gets caught in a doldrum here he can spend hours pleasantly and profitably watching the sponges, corals, bright-colored fishes, and other curious sea forms through a water glass. It would be difficult to find a pleasanter spot in midwinter.

But where bananas, pine-apples, limes, and other good things grow well weeds also grow, since a weed is merely a plant out of place. One of the worst weeds of all is a grapevine, but some day a fine grape may be budded on its roots. One must work or his plantation will soon be a mass of ravenous vines. Here, too, the soil is rock. There is no chance to plow or even to grub. Planting is done with a crowbar and weeding with a machete. Then in summer when the fragrant limes are ready to pick, the mosquito is present in such numbers that words are weak and language inadequate to describe it. They come out of every crevice in the rock, out of the salina land, and out of the mud holes and abandoned cisterns by the million. When the mosquitoes get absolutely unbearable the natives put their children, dogs, and chickens on their boats and move off to sea or go down to Key West, which is Conch paradise. There is one island called Bamboo Key which they say is always free from mosquitoes for some unaccountable reason.

Fresh water is scarce, so that every house must have its cistern. The well water is brackish. The coral rock is merely a cap set upon the mud by the activities of the coral polyp, which is still at work. Sponges grow actively in the miles of shallow water, and the day is not far distant when there will be extensive sponge farms throughout this region.

In short, this is a peculiar and in

Seminole Indians in Their Dug-outs Near Miami

Alligator Eggs and Young Alligators Just Hatched in the Glade Back of Miami

many ways attractive country. It has remained about the same for many years, but with the general awakening throughout the Caribbean, the American mediterranean, it will be the first to feel it. Although it has drawbacks, the fact that it is truly tropical, that it is the natural gateway to the great Tropics beyond, that it is in the track of the great commerce to the Gulf, that it is of great strategic importance, and that it is soon to be traversed by a railroad which will be a stupendous and interesting engineering feat and will bind the keys together like a string of pearls, it will soon be the site of many winter villas and of gardens yielding the choice fruits and vegetables of the Tropics in addition to the sponges, fishes, turtles, and other products of the sea.

The railroad project to Key West was the subject of an article in THE NATIONAL GEOGRAPHIC MAGAZINE some years ago. Concrete construction will figure prominently in this work. It will rest on solid piers with re-enforced concrete arches. One plan calls for 50-foot spans, the other 80. The height is the same in both cases, 25 feet from the water to the crown of the arch, the track being 31 feet above the water. The concrete work is about six miles in length, part of it in the vicinity of Knight's Key, the remainder between Bahia Honda and Big Pine Key. A large percentage of the water spaces will be filled with a solid embankment, leaving an occasional waterway 25 feet in width.

PROSPEROUS IDAHO*

WE'RE all proud, of course, to have the largest and most formidable ship in the navy named after our state. It's an honor that we appreciate. At the same time we know and don't mind saying that the state is worthy of the battleship.

Idaho, you know, is the state that is going to prosper most from government irrigation. We have twice as much land and twice as much water to reclaim it as any other state affected by the Corey act. Already work is in progress on irrigation plans which will reclaim to cultivation half a million acres.

The Minnedonka plan, which will conserve the water of Snake River, will make tillable 140,000 acres, and of these 90,000 will be open for cultivation June 1 next. These 90,000 acres are already settled. Work is in progress on an even larger irrigation scheme, the Boise-Payette plan, which will distribute the waters of the Boise and Payette rivers over 350,000 acres.

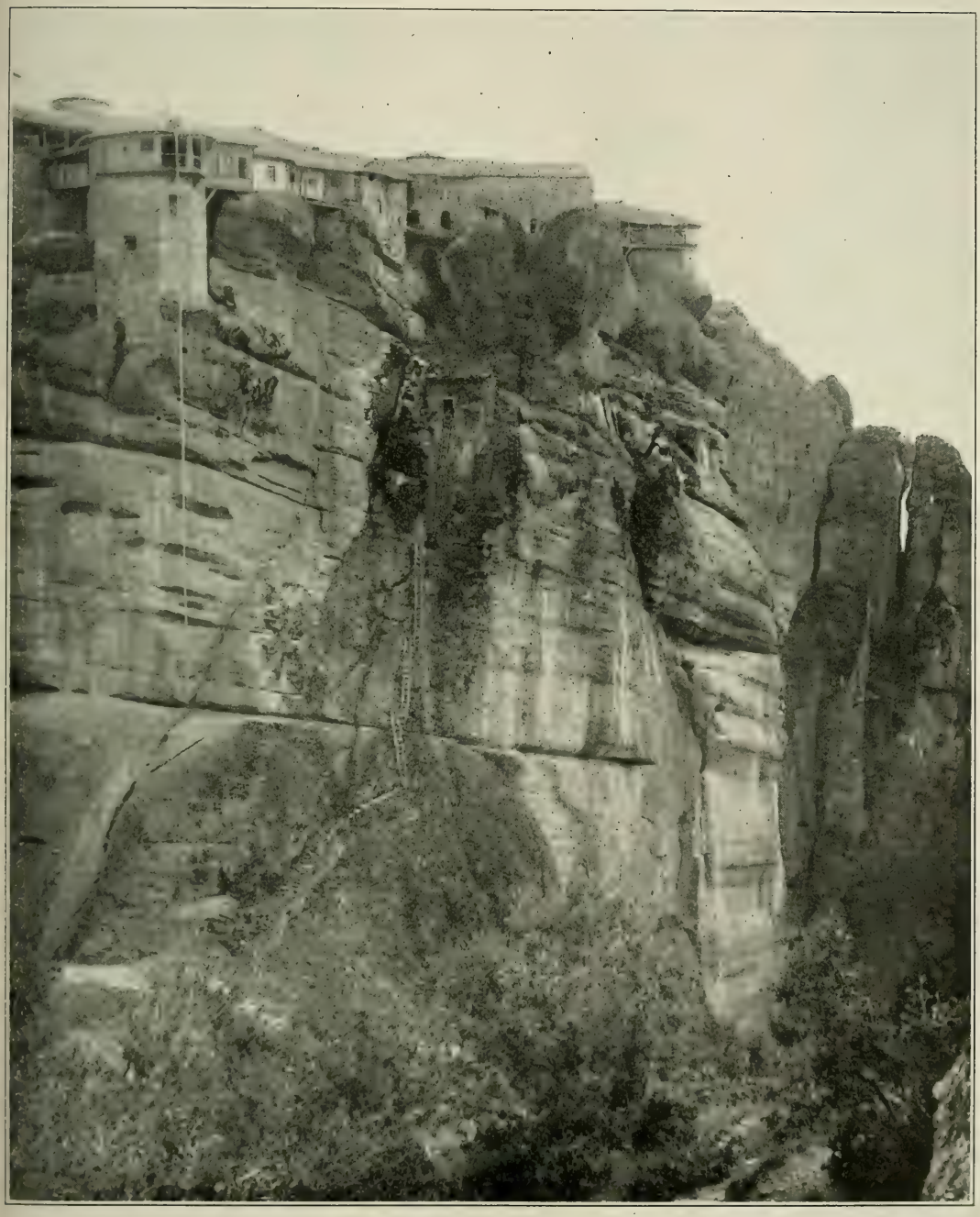
The great advantage of irrigated land is that it reduces agriculture to an exact science. The farmers aren't at the mercy of the weather man. There are no dry seasons and no wet seasons.

In sugar-beet culture, for instance, Idaho will soon be the leading state. We already have three large sugar-beet factories and are going to have two more, one at Payette and the other at Norma, in the near future. These new factories will each slice up 1,200 tons of beets a day. That means something. It means that each one will manufacture 18,000 tons of sugar in the course of a campaign. Beet culture is very profitable to the growers, and the Idaho beets have a higher percentage of saccharine matter than those raised in any other state.

In the northern part of the state we have the largest tract of white pine in this country and we also have extensive forests of yellow pine. In both sections there are rivers to float the timber, and all we need to realize on the wealth of the forests is better railroad transportation.

I doubt if any state is richer in minerals. Already we produce 53 per cent

*An interview with Governor Gooding, of Idaho, published in the New York *Sun*, December, 1905.



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Monasteries of the Air

The only ways (swinging ladder and windlass hauling net) of reaching the Monasteries of the Air, St. Barlaam and Meterion, at Meteora, Greece. The monasteries were built many centuries ago and are situated about 10 miles from the Macedonian frontier.

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Ascending to the Monastery of the Air (St. Barlaam) by Means of a Net Drawn by a Windlass. The Rope is 300 Feet Long.

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Another View of a Monk Ascending to the Monastery of the Air, Greece

Photo from C. C. Pierce & Co. Los Angeles, California

View of a Pigeon Farm at Los Angeles, California

Photo from C. C. Pierce & Co., Los Angeles, California

Another view of the Pigeon Farm at Los Angeles, California

of the world's production of lead, and no one knows the wealth of gold, silver and copper we have. I think the largest part of our mineral wealth is still undeveloped. I believe that the United States government should have a department of mining.

In the central part of the state we have a wonderful grazing country and a country which is also capable of raising such immense crops of grain as, for instance, 50 bushels of wheat per acre, 90 of barley and 120 of oats.

Governor Gooding has been engaged in developing Idaho for twenty-five years. He is a ranchman and a banker, as well as a statesman. He feels that the greatest need of his state is improvement in railroad facilities, and is especially anxious to see constructed a road connecting the north and south parts. In his campaign for election he says he drove 175 miles and made his fight largely on a plan to connect the two sections of the state by rail.

THE ANNUAL DINNER OF THE NATIONAL GEOGRAPHIC SOCIETY

MORE than 200 members and guests were present at the annual dinner of the National Geographic Society, which was held in Washington on the evening of December 20. Secretary of War and Mrs Taft were the guests of honor of the evening. The large majority of those present were residents of Washington, but a number had come many miles to be present, Messrs Angelo Heilprin and Henry G. Bryant from Philadelphia, Professor Libbey from Princeton University, Messrs W. S. Champ and Anthony Fiala from New York, and Major Thomas L. Casey, U. S. A., and Mrs Casey from Saint Louis. California, Texas, Wisconsin, Michigan, Alabama, Ohio, Illinois, Virginia, Kansas, Nevada, Wyoming, and Pennsylvania were represented by members of the U. S. Senate or House of Representatives. It was the first annual dinner of the Society, and the occasion was so successful that it has been decided to hold an annual banquet each year during the week preceding Christmas. The following paragraphs from an account in the *Evening Star* of December 21, by Albert F. Ferguson, may prove of interest:

"Mr William H. Taft of Ohio and Mrs Taft were the guests of honor at a dinner given at the New Willard Hotel last night by the National Geographic Society. Though it was as Justice Taft of the United States circuit court or as Governor Taft of the Philippine Islands, and later as Secretary Taft of the War Department that he became generally known to the people of the country, the members of the National Geographic Society desired to do honor, not to the jurist, the administrator or the statesman, but to the man who had the force and ability to be each and all, and who devoted his energies and many talents to the cause of his country.

"At the beginning of the speechmaking which followed the discussion of an excellent assortment of substantial edibles, Prof. Willis L. Moore, as its President, announced that the National Geographic Society had a membership of eleven thousand. In its endeavor to honor Mr Taft, however, the organization strayed beyond the folds of its membership and gathered about the six long tables set for the dinner an array of men and women who represented not only persons whose thoughts turn to subjects geographic, but

an infinite variety of professions. The statesman, diplomatist, soldier, sailor, writer, legislator and explorer rubbed elbows with the capitalist, the philosopher, the poet and editor. As was to be expected, the geographical limits of the United States were not observed when the invitations to the dinner were dispatched. Lady Durand, wife of the Ambassador of Great Britain, the Ambassador of Brazil and Madame Nabuco, the United States Minister to Japan and Mrs Griscom, the Governor General of the Philippine Islands, members of the Russian and German embassies and the Japanese legation, Mr. Anthony Fiala, W. S. Champ and W. J. Peters of the Ziegler polar expedition were among those present who might be considered as representing the physical divisions of the globe, while the United States was fully and freely drawn on, not only to form the guest list, but to make up the membership of the Society.

"The time set for the beginning of the dinner was 7 o'clock. After the guests had been relieved of their wraps they were presented to Professor Moore, who, in turn, presented each person to Mr and Mrs Taft. After the informal reception and exchange of greetings dinner was announced and the company gravitated in the most natural way to the tables. Each guest was apprised of the place assigned to him or her around the six long tables and there was little confusion while the two hundred or more men and women found their seats. The dinner began in the most informal way as soon as every one had been seated. The tables were laid in the conventional gridiron shape, with the guest table raised a couple of feet from the level of the other five. Prof. Willis L. Moore, as President of the Society and toastmaster, was in the center and about him were ranged the distinguished guests. The members of the Society and their wives and the other guests and their wives occupied places at the other tables, all of which seemed blanketed in the mass of green vines and roses that had been placed upon them in artistic confusion. Pink and white carnations were the boutonieres and dainty boxes of Huyler's candy tied with pink ribbons were given the diners of the fair sex as souvenirs of the occasion. The menu was all that could be desired, and after ample time had been allowed for its service and enjoyment Professor Moore drew the attention of the assemblage to the center table and the speechmaking began."

The toasts which were all informal were as follows:

THE TOASTMASTER—PRESIDENT WILLIS L. MOORE

Ladies and Gentlemen:

The National Geographic Society takes pleasure in having so many distinguished guests with it this evening. We have with us representatives of several of the great nations of the earth. We have representatives from our own Senate, from the Executive parts of our government, from our House of Representatives, and from those who represent the scientific part of our life. The National Geographic Society extends to you all a most hearty greeting.

Before this gathering it might be apropos for me to say a word in regard to the National Geographic Society and its members. My speech shall not be long. Its membership has come almost exclusively from the thinking, intellectual people of this city, of the nation, and somewhat from all nations—those who wish to keep abreast with the thought and activities of the world at large. This Society was founded in 1888 by Gardiner G. Hubbard, General A. W. Greely, and Mr Henry Gannett; they are the three active spirits that gave birth to this organization. Its membership numbers over eleven thousand today—an intellectual, thinking membership of over eleven thousand. Its receipts are nearly $30,000 per annum,

not one dollar of which, directly or indirectly, goes to any officer of the institution (applause), if I except our Editor, who gives his whole time to the work and who edits our NATIONAL GEOGRAPHIC MAGAZINE. It is an honor for us to serve the National Geographic Society; that is sufficient remuneration for us.

Geographic science is almost the highest—practically the mother of all natural science. It considers the lithosphere, the hydrosphere, and the atmosphere—the earth, the water, and the air. It has to do with the fauna and the flora—the two forms of life that are the effects of sunshine, heat, and moisture. It is interested in all forms of research whose objects are to discover the laws that underlie natural phenomena. It is concerned with research, with exploration, with the determination of the configuration of the surface of the earth, and with the determination of those far-away geographic boundaries that are so little known. It gives thought to the formation of and change of political boundaries; to the climatic, the geologic, and the economic environments that cause human families to move and to weld themselves into great national units, and the causes that effect the disintegration of those units. Geographic science, therefore, as we understand it, my friends, covers a broad field. We can hope to cover but a small part of it, and that part only imperfectly. I listened but a few days ago to a sermon by a great Scotch divine. He said, "Ill fares the nation where wealth accumulates and men decay." Now, the National Geographic Society, in its humble way of diffusing knowledge, is aiding to create men who do not decay. It is aiding, with other institutions of its class, to build human character which shall inure to the welfare of the American people. It is adding a wealth that means a stronger, more united nation, and a higher civilization; it is adding a wealth that doth not corrupt—a wealth of human intellect. (Applause.)

I said that the founder of this Society was Mr Hubbard, who acted with the aid of two of those who are with us tonight. The heirs of Mr Hubbard, Mr Alexander Graham Bell, Mr Charles J. Bell (who I am glad to say is present), and the other heirs of Mr Hubbard have very generously given to the Society a beautiful building for its home, without any obligations on us, financial or otherwise. It is a memorial to Mr Hubbard. Some poet has said, "Millions of the spirit surround us forever, and the soul that once lived shall never more die," and as we gather here tonight I can imagine that the spirit of our first President is looking down upon this scene and with his heart filled with gladness bidding us God-speed in the work of the National Geographic Society, and I would ask you one and all to rise and silently to drink to the memory of our first President, Gardiner Greene Hubbard.

Our first toast of the evening is "The President and the Flag." Our civilization was first planted on the eastern shore of the continent, thence it traveled over the Allegheny Mountains into the great fertile valleys of the interior. It soon crossed the wide plains of the West, mounted the rugged battlements of the Rocky Mountains, and then hesitated when it reached the placid waters of the western seas; but it was only hesitation, for finally it leaped forward from this island to that, and today we find the free institutions of this country planted at the very doors of the Orient. Therefore, from Washington to Roosevelt, every President of the United States has been interested in geographic research, in the alteration of the boundaries of political empires; and thus we come appropriately to the toast, "The President and the Flag," and who of those in our land is better

qualified to respond to that toast than the distinguished man who is our honored guest tonight? He has served in many capacities under that flag; served well, served with credit to his country, and before he rises to speak I will ask you, without leaving your seats, to drink to the health of the Secretary of War, our guest.

THE PRESIDENT AND THE FLAG—THE SECRETARY OF WAR, MR WILLIAM H. TAFT

Mr Chairman, Ladies and Gentlemen:

I was very much interested, in the statement the chairman has just made, to learn how much cheaper it is to run a geographic society than it is to build a Panama Canal. (Laughter.) There is one man connected with this association, whose name was not mentioned by the chairman, of whom I have the honor of being a cousin, and if I meet that gentleman under circumstances where the police will not interfere he will remember our relationship. (Laughter.) A number of months ago he inveigled me to agree to make a speech on the Philippines, to make a speech which as I understood was simply to talk in a parlor, and the first thing I knew I found I was in an armory and talking to a most formidable audience. After having made the speech he came to me and thanked me for it, and then confidentially he said to me, "Now we wish to make you the guest of honor at a dinner." When I consented, I said to him, "That is all right about the honor part of it, but I have already made one speech for your Society and I do not wish to make another; it takes too much preparation;" and he agreed. Now I find that the way you compensate your lecturer for making one speech is to require him to make another. You cannot run the canal on that principle. (Laughter.)

The toast which has been assigned to me since I sat at the table—it was printed on the program—is "The President and the Flag." The discussion of one of these subjects would have been enough to overwhelm a man; but two, under the circumstances, I submit to the members of the National Geographic Society are certainly—with its corrupt management—more than a man ought to be subjected to.

The President. It is not too much to say that it has fallen to the lot of Theodore Roosevelt to be the President of the United States when its prestige as a nation has been carried to a higher point than ever before in its history. (Applause.) The influence of the United States for good on this round globe is greater than it ever was before, and that is due not only to the material progress and the marvelous growth of this nation, not only to its capacity for war, should that be challenged, but to the moral position that the United States occupies among the family of nations as not seeking to aggrandize itself, but anxious only to produce peace and prosperity the world around. (Applause.) That is what our flag means wherever it flies, and the reason why, certainly one of the reasons why, the prestige of the nation has reached the point that it has, is the personality, the intense Americanism, and the limpid purity of the character of Theodore Roosevelt. (Applause.) He is the embodiment of the American spirit, and I do not think it too much to say, though they do not know him so well, that his personality and his character interest the people of foreign lands almost as much as they do the people in our country.

Now with respect to the flag. I have to suggest these things as they come. There has been an idea current for a long time, and especially in the mind of my Democratic friend, Senator Newlands, for he is almost the only Democrat we have today—all the others are slipping away—that the Constitution

and the flag were going to part company. Mr Dooley spoke of the Supreme Court, as you remember, as saying that four of them say the Constitution do follow the flag and four of them say it do not; and then Mr Justice Brown said, "You are wrong; sometimes it do follow the flag, and sometimes it do not, and I am the man to tell you when it do and when it do not." (Laughter.)

In deference to that method of describing the decision of the Supreme Court, and the effect of it, it seems to me proper to say that nobody—expansionist, imperialist, or anti-imperialist—has ever really contended that the Consitution does not follow the flag. The question is not whether the Constitution of the United States is in force in the Philippine Islands or in Porto Rico, or in Hawaii, or in the Canal Zone, or in Alaska, but the question is what particular restriction or limitation of the Constitution is applicable to the particular place.

It has been my fortune and the fortune of the lady who has linked her fortune with mine, to be somewhat peripatetic during the last four years, and I assume that it is that fact that entitles us to the consideration of the National Geographic Society. (Laughter.) I beg to announce that our traveling is over, that we have ceased to be the peripatetic members of this administration, and that hereafter Secretary Root and Mrs Root will be found to fill that honorable position. (Laughter.) The Brazilian Minister and his lady, who do us the honor of being present tonight, have advised us that Secretary Root has agreed to go to Brazil to attend the Pan-American Convention at Rio Janeiro. Now I advise the Brazilian Ambassador to interrogate Mr Root each month and each week, as to whether he is going, because I have had an experience with the Secretary of State before he became the Secretary of State as to the value of promises of that kind. He agreed to go with me to the Philippines, and I interrogated him each month and he promised each month until July, when he failed me. But it was his loss that he did not go (laughter), as Senator Newlands will testify.

We are getting up a society of the Philippine trip, and we are getting it up because we find that we have talked so much about the trip that nobody will listen to us except those who were on the trip (laughter), and we are determined to have an audience. The jokes which we regarded as exclusive and well worthy of constant repetition seem to tire even those members of our families that ought to respect us, and especially ought to respect the jokes, however old; but family discipline wanes and we are made aware of the necessity, as I say, of an organization, an exclusive club of the visitors to the Philippines.

Seriously, ladies and gentlemen, I am very grateful for the honor conferred upon Mrs Taft and myself tonight by this very magnificent dinner and assemblage. I feel deeply the humiliation of not having been able to prepare something worthy of your hearing, and for that lack you must charge the corrupt management of your association. (Laughter and applause.)

THE TOASTMASTER

It has been stated that when the present Secretary of War was Governor of the Philippines there came a rumor to Washington that he was in bad health, and the present Secretary of State, who was then Secretary of War, cabled over to the Philippines and asked what was the truth of the matter. The Governor of the Philippines answered that there was no truth in the rumor; that he had actually ridden fifty miles on horseback that day without dismounting, and had arrived

in fine condition, and I understand that the then Secretary of War, our present Secretary of State, cabled back and congratulated him on his good health, but solicitously inquired as to the condition of the horse. (Laughter.)

Our next toast is "The Occident and the Orient." The modern means of transportation and communication are bringing the East and the West so close together that they may soon be like the man who, while threading his way through the crooked streets of Boston, became confused and finally met himself coming from the opposite direction. So it is that applied science is each day bringing the Orient nearer and nearer to the Occident; and still there is an Orient and there is an Occident, and the gentleman who will respond to that toast was our Charge d'Affairs at Constantinople for a considerable time, and was our Minister to Persia, and for three years has been our Minister to Japan—the Honorable Lloyd C. Griscom, who will now respond.

THE OCCIDENT AND THE ORIENT—THE AMERICAN MINISTER TO JAPAN, MR LLOYD C. GRISCOM

Mr Chairman, Ladies and Gentlemen:

I think I might well begin by asking your indulgence. I need hardly tell you that the Secretary of War is a hard man to follow. I think Governor Wright and all subsequent governors of the Philippines will bear me out in this, and Mr Taft this evening is not the only one who has been troubled about the toast assigned to him. I was informed that I was to treat exhaustively and conclusively of the relations between the Occident and the Orient, but at the same time I was told that I was to strictly limit my remarks to ten minutes. Now I make no pretense of being able to accomplish this purpose. I do not understand this limit business; it is a matter which is understood by Senators and by Representatives; but in diplomacy the idea of a time limit never enters into our diplomatic minds. (Applause.) I feel, however, that there are certain phases of the toast of which I may treat. I was told by way of instruction, also, that I should try to confine my remarks to geographic subjects, and to endeavor to instill into you, without your knowledge, a little increase in your information about the geography of the world at the same time you were imbibing and thinking of more substantial matters, and at the same time I was warned not to treat too heavily of geographical matters, and to remember that there were ladies present. (Laughter.) Now I am endeavoring to the best of my ability to follow all these instructions, and the only thing, the only subject that occurs to me of which I might speak will be the country of Persia, which is the only country in which I happened to have made a journey of any unusual or out of the way character.

Now I would like very much to tell you of a trip which my wife and I made when we rode a thousand miles on horseback, and had many adventures, but I am confronted with this serious question of time, and I can only try to give you a little better understanding of the oriental character by mentioning some of the incidents of our journey. I recall that in the middle of a trip we made through the central and western part of Persia we were very hospitably entertained by the great chief, the tribal chief, a man of you might say savage birth, but very much of a gentleman at heart. To give you an idea of his character I might say he pointed out to me one day a scar on the top of his head which was obviously a bullet hole, and he said to me, "I received that from the last distinguished stranger who came this way." (Laughter.) And I said, "How was it." He said, "Well, shooting goat, shooting

mountain goat, wild mountain goat, and one of the shots of this gentleman's rifle struck a rock on the mountain side and ricochetted back, and by the merest chance inflicted a very serious wound. But," he said calmly, "I never told that; he never knew I was hurt because I put my heavy fur cap that the Persian's wear over my head, and it bled inside until we got home and he never knew it." I said to him, "What was the name of the gentleman who shot this hole in your head," and he said very proudly, "It was His Excellency Sir Henry Mortimer Durand." (Applause.) I only mention this to illustrate the innate hospitality and character of this savage tribe. And we learned a lesson which is the same the world over; if we have to be shot in the head, we prefer to have it done in a careful and diplomatic way. (Applause.)

Further on we were engaged in several fights with different tribes—protected always by an escort on this journey—and I could tell you many things that would increase your interest. And I recall on one occasion when we were in the middle of a very unpleasant fight, being shot at from all sides, my wife was ill and being carried in a litter, the old chieftain who was at the head of our escort begged me to mount my horse and fly quickly over the mountains. He said escape was easy. I pointed out that my wife could not escape this way, and refused his suggestions. He turned to me rather sadly, stroked his beard and said, "Well, sir, you indeed are a very young man. When you have reached my time of life you will know there is only one of you, but there are as many wives as there are sands in the desert." (Laughter.)

I could go on and tell you about these people, but I have a better method than that of letting you know what they are. I have only to recommend to you the delightful book by Lady Durand called "A Northern Tour in Western Persia," wherein she describes far more conclusively and far more beautifully these people and this country, and in all sincerity I recommend you to read this book. And now if you will permit me to leave the toast which has been assigned to me, I cannot help thinking of Kipling's lines where he says "West is West and East is East, and never a twain shall meet," and I feel very strongly he might rewrite this if he had occasion to visit the Far East during recent years—certainly it must be very largely modified. He perhaps does not appreciate what even one great traveler can accomplish; but there are several classes of travelers and there is only one class in particular which I admire; I admire a man who travels for the purpose of bringing closer together two great people, I refer to the American people and the Philippine people. I have seen in the Far East the effect of one man's work. I am sure you already suspect to whom I am referring, for there is one name in the Philippines, the name of one American which will go down in their history as long as there is a Filipino people in existence, and that is the name of our distinguished guest this evening, the Honorable William H. Taft. (Applause.)

Now Mr Taft has done more than travel a hundred thousand miles. The geographies showed that when we took the Philippines from Spain, or acquired them from Spain, there were 1,100 islands in the Philippines, and now our census shows that at the time Mr Taft left the Philippines there were over 3,000 of them. I am tempted to ask, like District Attorney Jerome, "Where did you get them?" Now Mr Taft has sought for virgin soil, and I can assure you he has found a place—found, discovered, occupied, and taken possession of a place which no man had sought after before—I mean a place in the heart and affection of the Filipino. It

is from such men as Mr Taft that we really learn our lessons in geography. It is really from him that we have learned all we know of the Philippines. And who taught us what we know of the geography of China? John Hay. And now in my opinion we are about to learn a lesson of the geography of South America, from our distinguished Secretary of State, Mr Elihu Root. It is from such statesmen as these that we learn the lessons in geography, and I feel that I voice the sentiment of those in this assemblage when I say that I am very proud of it that I can be here tonight to join in trying our best to do honor to one of these three great men. (Applause.)

THE TOASTMASTER

Our next toast is "The Press." Many good things came outof Kansas besides bumper wheat and corn crops; one of them is the gentleman who will respond to this toast, and just now I am reminded of the Irishman who was passing through a cemetery and he saw an inscription on a beautiful monument which read: "An editor, a Congressman, and an honest man;" and he said: "Faith, three of them in one grave." (Laughter and applause.)

Now, my friends, when our guest who is to respond to this toast passes over the divide whence no traveler returns—and we hope it will be long, long years to come—he can be laid away and they can inscribe on his tomb that inscription that the Irishman read, and it will be true, and there will be but one man in this sarcophagus. I introduce the Honorable Charles F. Scott, of the press, and of the Congress.

THE AMERICAN PRESS—MR CHARLES F. SCOTT, REPRESENTATIVE FROM KANSAS

Mr Chairman, Ladies and Gentlemen:

First of all, Mr Toastmaster, I wish to express my regret that the toast to which I am asked to speak could not have been assigned to another. It is a great subject, a noble theme, and it deserves to be discussed by one who is not handicapped by sentiments of modesty from saying all that he really believes. You will understand how far your present speaker is from fulfilling this requirement when I say that I was born in Kansas, and with the exception of a few brief months of annual exile in Washington, I have lived there all my life. From my earliest infancy, therefore, I have breathed the atmosphere of reticence and self-effacement which pervades that blushing and diffident commonwealth (laughter), and which has made modesty, particularly when the riches and resources, the glory and grandeur of our state are under discussion, the badge of all our tribe. "Such boasting as the Gentiles use or lesser breeds without the law" is never heard from the lips of a true Kansan when his state is the subject of discussion, for the actualities of her development and growth make the most daring boast of today sound like the language of detraction and disparagement tomorrow. And furthermore I am myself a part—an inconsequential part I hasten to confess—but still a part, of the American Press. For nearly a quarter of a century my chief business has been the making of newspapers—a business, as you all know, which breeds in its devotees that distrust of self, that deference to the opinions of others, that doubt of one's own infallibility which so far unfits them for contact with a rude and buffeting world.

By avocation and training therefore, as well as by birth and environment, I am peculiarly unfitted for the discussion of a theme that calls for bold and positive utterances.

But I can well understand how one, not a Kansan and not a newspaper man, might rejoice at the opportunity

which this toast affords to pay tribute to the greatest single force in our civilization. And I can well understand how those responsible for this program would have regarded it as incomplete without at least a word concerning your most active and potent coadjutor, I had almost said your monitor and guide. You, gentlemen, members of the National Geographic Society, and others like you, are the makers of maps; but the newspapers are the teachers of geography. You made a map long ago of the Dark Continent; but the gloom that obscured the heart of Africa was not dispelled until an American newspaper man, sent by an American newspaper, penetrated its forbidden fastnesses and let in the light. For three hundred and fifty years your maps have pictured the Philippine Islands; but the world in general never heard of them until the thunder of Dewey's cannon across the startled waters of Manila Bay was echoed in the newspapers of every land. Members of this learned society have doubtless known from the beginning of Mukden and Harbin and Vladivostok and Port Arthur and Sakhalin, but it remained for the newspapers to make that knowledge universal.

You, gentlemen, are the makers of maps. But sometimes your maps are wrong. I will not yet admit that I am old, but I am not so young but I can remember when your maps branded the western two-thirds of Kansas as a part of the great American desert! That section of my state, gentlemen, produced this year 80 million bushels of wheat, besides corn enough to feed cattle enough to subsist soldiers enough to conquer the earth. My good farmer friend, our distinguished Secretary of Agriculture, thought that map was right, and in a recent speech he inadvertently used the word arid in connection with that portion of the state and he had to go 1,500 miles to apologize. It was the newspapers that corrected that map. They were the pioneers. They blazed the way westward, and the people followed, timidly at first, and then triumphantly, making farms where your maps said the desert was, building cities where the National Geographic Society never had the faintest idea that the coyotes and the prairie dogs would ever be disturbed.

But it is not only in Kansas and in things geographical that the newspapers have blazed the way. All over the civilized world, and in every cause that has engaged human thought and activity and courage they have been the pioneers, the pathfinders. It was in 1622—when the reign of James the First was drawing to a close, when Ben Jonson was poet laureate and the personal friends of William Shakespeare were lamenting his then recent death, when Cromwell was brewing beer at Huntington, when Milton was a youth of sixteen just trying his prentice hand at Latin verse, and Hampden a quiet country gentleman in Buckinghamshire, that the first newspaper addressed to English-speaking people, the *London Weekly News,* issued its initial number. A puny sheet it was, of four small pages, printed from rude type, no doubt with intolerable ink, on coarse and dingy paper, and we can well imagine the quibs and jibes flung at it by the wits among the few who could read it. What prophet or seer among them all could have foretold that with the advent of that petty periodical there was born into the world a force that was to carry light into the dark places of the earth, that was not only to record history, but to make it, that was to prescribe penalties and proclaim rewards, that was to take the slave by the hand and make him a man, that was to declare war and proclaim peace, that was to make freedom universal and tyranny impossible, that was to make puppets

of kings and to put into the hands of the people the scepter of sovereignty. Feeble and ineffectual no doubt that first leaflet was, a mere rushlight emitting but the faintest glimmer, but in three hundred years to what power has it grown—a blazing sun under whose searching glare there is no concealment. Ah, what battles the press has fought—for its own freedom first of all, for until that battle was won no other victory was possible. For its own freedom first, and then for the truth that makes all men free. I do not need to be reminded that what I assert concerning the effort and influence of the press as a whole can be controverted with individual exceptions. Tyranny has never lacked apologists and defenders and error has always had its paid and perjured champions. But these exceptions have been so few and feeble that in the general summing up they may be neglected altogether. In the main the mighty enginery of the press has wrought for righteousness, for freedom and justice and truth. Describing the condition of the English laborers in the days of the Stuarts Lord Macaulay could think of no phrase of deeper commiseration than to say "They had no newspaper to plead their cause." What a tribute that is to the universality with which the press of our day can be relied upon to interpose its everlasting prohibition "Thou shalt not" between the weak and those who would oppress and despoil them.

It was Lord Disraeli, I believe, who first characterized the English press as the Fourth Estate. Here in America it is the first estate. It wields incomparably more power than any House or Senate or President, for it makes houses and senates and presidents. It may not make judges, possibly, but it has sometimes been suspected of having a large share in making decisions. "I don't know," said Mr Dooley, "whether the Constitution follows the flag or the flag follows the Constitution, but I do know that as long as the Supreme Court keeps one eye on the newspapers and another on the election returns it won't go very far wrong." (Applause and laughter.) The newspapers may not always use their great power wisely and honestly and well. But when was ever great power, except that which dwells with Omnipotence itself, used always wisely and honestly and well? "There were doubtless a good many verdicts for the plaintiff that ought to have been for the defendant," said an old judge once in describing a district over which he had formerly presided, "and there were a good many verdicts for the defendant that ought to have been for the plaintiff, but in the main justice was done."

In some few cases the American press may cause pain to the innocent, but in ten thousand cases it puts the fear of God into the heart of the guilty. It may not always uphold the virtuous as it should, but it follows with sleepless vigilance upon the trail of the doers of evil. Sometimes it may "bend the pregnant hinges of the knee" in the presence of ill-gotten wealth, "that thrift may follow fawning," but more often it pinions in the pillory of public condemnation and contempt the dollar-mad devotees of high and unholy finance. Its editorial columns may sometimes be timid or corrupt, but everywhere and all the time it prints the news. And therein lies its greatest power, thereby it renders its most important, nay its altogether indispensable service. Publicity has come to be the master word in our present day statecraft. Strange that we have been so long learning it. Strange that we could not have sooner read the real significance of that first mighty commandment, thundered by Jehovah into the darkness and disorder of a world that was without form and void, "Let there be light!" Let there be light that those whose deeds are evil

may have no cloak to hide them. Let there be light that the hidden things may be made plain. Let there be light that the rocks and shoals which threaten our ship of state may be uncovered. Let there be light that we may walk without stumbling in the pathway that leads through civic righteousness and honest administration to prosperity and tranquillity at home, to dignity and honor among the nations of the earth. Let there be light, the first great commandment which Omnipotence itself must make before order could be brought out of primeval chaos. Let there be light, the last great commandment which the wisdom of man has at length evolved as the surest solvent of the hard problems which confront a nation whose highest ambition is orderly liberty under the law. Let there be light—and the clearest and steadiest light, the most searching and insistent light, the most persistent and relentless light, the light that will most surely and safely and steadfastly guide the American people in the paths of probity and prosperity and peace, is the light that shines through the free and fearless columns of the American press. (Applause.)

THE TOASTMASTER

I fully agree with everything that Mr Scott has said in regard to the American press. I believe that it is better that individuals at times should suffer from the license of individual members of the press than that the press as a whole should be restricted in a free discussion and criticism of men and events. We know that the sunlight destroys the microbes of disease; likewise the uncovering of official, and personal, and business actions by the press is, I believe, a greater deterrent to crime than most of the laws on the statute books. One of the crowning achievements of this American civilization I believe to be the freedom of speech and the freedom of the press. But I would take issue with my distinguished friend with regard to his criticism of our map-makers. We do not need to be told that Kansas is a great state. We know it, and take pride in it; but, once when one of our map-makers was traveling in Kansas, in the western part of the state, he met a man coming along with a lumber wagon filled with barrels. Our geographer asked him what he had in the barrels, and he said, "Water." "Where did you get it?" our representative asked, and the Kansan replied, "Up the road about seven miles," and our eastern man, who makes maps, said, "Why don't you dig a well?" The other replied, "Well, stranger, it is about as far to water in one direction as it is in the other." (Laughter and applause.)

So long as there is anything to challenge human courage there will be men to accept battle. The inhabitant of the north temperate zone, especially, goes against that which opposes, whether it be man or natural conditions.

We have with us tonight the leader of the Ziegler Polar Expedition. He was the second in command of the first Ziegler Polar Expedition, which was compelled to return. He then was placed in command of the second expedition. Our Mr Peters, of the National Geographic Society, was second in command and took charge of all scientific work. The second expedition stayed in the Arctic over two years, and after many hardships—fighting with climatic conditions that no human power could successfully combat—was rescued by our friend Mr Champ, the representative of Mr Ziegler. Mr Anthony Fiala will respond to the toast "The Arctic."

THE ARCTIC—MR FIALA

Mr President, Honored Guest, Ladies and Gentlemen:

I feel deeply the honor conferred in calling me before such a distinguished gathering. I think I ought

to be here in fear, but the fact that I know you are all brother explorers gives me courage. Every person, as in the days of old, in the days of adventure, who is looking to or doing something new, is an explorer, so that I feel that I am with my friends, brother explorers. (Applause.) The toast is a large one, and I won't attempt to treat fully of it. I know I could not respond to it as it should be. There are veterans in this room, one in particular, who could tell more of the Arctic than I could. Since the days of Herodotus and several of those early explorers, and later on in the days of the Norsemen, men have been trying to find out things about this open world of ours; they have been following the original command to Adam to subdue the earth, and it is pretty nearly subdued. There are only two places, practically, on this globe where there is still a chance of investigation, of discovery, the chance of making new maps, that is in the Arctic and the Antarctic.

A returned explorer has generally to face three questions—I know they have come to me. One is, "How far north did you get"? That is a hard one to answer; it makes the explorer feel badly. The second one is, "What is this all good for anyway?" and the third, "What do you go up there for and waste your life away in that region of ice and snow?" and yet your answer to that last question brings back the first one, as to how far north you got—showing they have an interest in why you went there.

I have often thought of our trip into the north. The first year, two sledge trips went over the ice and were failures, and then there was the return to Cape Flora, 160 miles south, where our relief ship was anchored in the ice, and there a large number of men waited while another party went north during the month of September, reaching our northern outpost November 20. Now the sun went below the horizon on October 22, and so you can imagine how much light there was to travel over these ice fields after the sun was down. Mr Peters and myself with a sledge ran repeatedly into ice columns which neither of us had seen, because of the darkness being so dense. The moon fortunately appeared, and we traveled over a glacier a thousand feet high to reach our camp, and that Thanksgiving Day will be a Thanksgiving Day that every member of that party will remember as long as he lives. To you who have traveled in other countries the daily life of the man on the polar trail is possibly of interest. These great fields of ice are in constant motion under the currents and the winds. Imagine yourself on 500 miles of solid ice grinding with that immeasurable force against a rock-bound coast; can you possibly comprehend what sort of conditions you have to combat?

You have to take care of your dogs; you have been traveling over ten hours a day, and when the time comes to camp at night the first thing the dogs have to be unharnessed, and the temperature is possibly 30 or 40 below zero, and you have to take your mittens off to get the dogs out of the harness. The poor dogs are tired, every one of the party is tired, and the little dogs crawl down in the holes made for them to sleep in. Then you go to put your tent up, and when you light your lamp and start to cook the interior of the tent fills with an intense vapor which you can hardly see through, and this vapor condenses on the interior of the tent and forms clusters of frost crystals that you have to brush off, and then it melts and forms part of the little rivulets of water that accompany your sleep that night. The sleeping bag itself, however, is a great place of comfort, and you know of what pleasant times you have in

your dreamland at night thawing out your sleeping bag of ice,—and you can imagine this sleeping bag thawed out in the moist atmosphere of its interior. These are simply ideas; we go there for that and we are perfectly satisfied. But this is the description of the thing that is of interest to most people, as some one has expressed it. And then the next morning you get up at your usual time and it often seems as though you only had half an hour or even fifteen minutes' slumber, and sometimes if you get that much on a very cold night you are lucky.

So you have to confront a problem of a trip of 500 miles up and then there is 500 miles back; your dogs eat a pound a day and a man eats three pounds a day. If you make 10 miles a day, which has never been made, it would take you 100 days. Your dogs eat one pound a day, and if you have 10 dogs that means 10 pounds; a man eats three pounds a day, and without taking into consideration the weight of your sleeping bag, tent, or any of the equipment, there would be an expenditure of 13 pounds a day. Now you can put about 600 pounds on a sledge, so you can realize what the total weight must be, and you will realize some of the problems that stand before the explorer.

Then of course you know about these sledge trips. We have to work many hours a day. We start out about 5 o'clock in the morning and work late in the afternoon, and some days we do not make more than a mile and a half, the poor little dogs pulling as only dogs can, do their best.

To me it seems that the end of the Pole will be reached, but as to how soon I cannot know. I have often thought that a drift ship would be the way—a drift ship equipped with wireless telegraphy, and then the party would leave it and go off on their sledge trips and communicate back and forth with the drift ship by means of the wireless telegraph. But the problem of reaching the Pole is yet to be solved.

I thank you, ladies and gentlemen, for your kindness. I appreciate this honor of standing before you. The Arctic is a grand subject; it is a great country; there is very little known about it even in a commercial sense; but the value in dollars and cents has paid for the exploration. Millions of dollars have been returned to the countries who have sent out these exploiting parties, and so there is work in that way; and furthermore, as I have stated already, we have received the commandment, "Subdue the earth," and as long as there is a spot in the earth that has not been subdued, man will try to accomplish what he was placed on the earth to do. (Applause.)

THE TOASTMASTER

In inviting Mr Champ, who led the expedition that rescued Mr Fiala—of which he did not tell you—after they had been in the Arctic over two years and their position had become one of extreme peril, I have promised him that I would not call on him to speak. In this I am reminded of an incident that occurred when General Sherman was invited over to Philadelphia to attend a dinner of the Clover Club. He arose to speak, but the members made cat calls, and the quartet sang, and he was finally compelled to sit down in confusion without finishing his speech, and he was naturally angry. The next year, realizing they had offended the General, a committee came over and stated to him that they felt extremely sorry for what had occurred the year before, and asked if he would not show that he had forgiven them by coming again. The General agreed, but exacted a promise from the president that he would not ask him to speak. The night of the banquet came. The General had enjoyed a good dinner and was serene,

when the president arose and told how he had solemnly promised the General that he would not be called on to speak, but "Gentlemen," he said, "you know what a liar I am," and then introduced the commander of the U. S. Army, who, I am glad to say, was kindly received this time. Following the precedent thus set I shall ask Mr Champ to get up and say a word; if he cannot say a word, let him get up and show what a good-looking fellow he is, and then turn around and sit down.

A POLAR BEAR STORY—MR W. S. CHAMP

Mr President, Ladies and Gentlemen:

I indeed feel greatly honored to be present this evening, and I will say that I have a very high feeling toward our worthy President, for I am a member of the National Geographic Society. I feel very kindly toward him for affording me an opportunity to pay tribute to himself, Mr Grosvenor, and the Executive Committee of the National Geographic Society for their hearty cooperation and their assistance in equipping the Ziegler expedition with such a worthy representative as Mr W. J. Peters. (Applause.) In addition to Mr Peters, there was also another member attached to the expedition who is also a member of your Society. I refer to Mr Russell W. Porter, and I am proud to say, gentlemen, that these two men, assisted by a few others, accomplished a great deal of work under the most trying conditions. They have succeeded in doing work that I am sure you will find to the credit of the National Geographic Society, as well as to the Ziegler Polar Expedition. As regards Mr Fiala, it is a great pleasure for me, as the representative of the late Mr Ziegler, to pay tribute to his manliness, and I feel that I am justified in saying that he carried out, under the existing circumstances, to the very best of his ability, the sacred trust. They encountered very trying conditions; they were unfortunate in the loss of the vessel with a very large portion of their supplies; they had high temperatures to contend with which made sledging very difficult. Considering all things, I feel that they have done their duty.

I feel like asking your indulgence in listening to a little story, an incident which happened on board our relief ship this year. Today there is in your zoological park a small bear called "Buster," a polar bear. This member was captured by the relief ship and was presented to the National Zoological Park. I want to tell you in a few words the story of his capture. To me it appeals strongly, as it occurred after we had been in the pack about 20 days, or about 150 miles into the pack. We were enveloped in a very dense fog for three days, and when the fog lifted on the skyline we noticed a very large bear with a young cub. Everybody on board ship was very quiet when we went into the pack, though we knew there was nothing to fear and we waited to see what these bears would do. As a sportsman, I want to say there is no sport in killing a polar bear; they come right up to the ship; they do not know what a human being is, and as a result of their hunger and curiosity they come right up to you; this bear had evidently been hunting for food for several days. She encircled the ship entirely and gradually worked her way up to the ship. In the meantime, the doctor who was on board and one of the harpooners and myself went on the ice and crawled up toward the bear behind a huge cake of ice, and finally dispatched the old bear. As a usual thing, when a mother is shot, the cub will run away, but in this instance the young bear sat over the mother and fought us off. We fought her with our rifles and I finally sent the harpooner back to the ship for more ropes and more men. We lassoed the cub and brought it to the ship, and in its efforts to get back to its mother

it very nearly bit its tongue off. We made it fast to the deck, and that was about 6 o'clock in the evening. About 9 o'clock the little bear was suffering so from distress that finally I told the captain if he would shoot it it would be a great relief, but I didn't want him to shoot it while I was on the deck or on the ship. I was going down the gangway when the thought struck me, if I can get the skin of the mother to this cub, possibly it will quiet her. I went on deck and told the captain to get the skin of the mother, and the little cub jumped on the skin and fell asleep. It slept for about 20 hours; the only sign of life in the cub was the twitching of its muscles. About three days after that I was standing watching the cub; its tongue was so swollen that it could not eat anything; it took its mother's skin and turned it over and started eating the blubber, the fat off of its own mother. It lived for eight days in that way. After that we put it in a cage, took the mother's skin away and brought it to New York, and shipped the cub to the park here and that little bear is now in Washington. I thank you, ladies and gentlemen. (Applause.)

MEMBERS AND GUESTS PRESENT

The Arctic was also the subject of an address by Mr Walter Wellman, who recited an incident of his dash for the Pole. Another distinguished Arctic explorer, and one of the founders of the Society. Brigadier General A. W. Greely, U. S. A., made a brief address, in which he spoke of the era of peace among nations, and the evening's entertainment was brought to a close with a benediction by Representative Burton of Ohio, who, on behalf of its guests, wished the Society Godspeed in its work.

Those present at the dinner were:

Lady Durand and Miss Durand, Representative and Mrs. James R. Mann of Illinois, Secretary of War and Mrs. Taft, the Ambassador from Brazil and Madame Nabuco, Mr. Eki Hioki, chargé d'affaires of Japan; Senator Perkins and Miss Perkins of California, Mr. Fiala, leader Ziegler polar expedition, and Mrs. Fiala; Henry G. Bryant, president Geographical Society of Philadelphia; Mr. Crist, Mr. Shaw, Baron von dem Bussche-Haddenhausen, counsellor and secretary of the German Embassy, and Baroness von dem Bussche-Haddenhausen, Professor Libbey of Princeton, Senator and Mrs. Thomas Martin of Virginia, Representative Lamb of Virginia, Mr. Champ, Mr. Peters, Mr. and Mrs. Walter Wellman, Mr. and Mrs. John B. Larner, S. B. Hege, Representative and Mrs. Joseph W. Babcock of Wisconsin, Representative and Mrs. Sydney Bowie of Alabama, Representative Theodore E. Burton of Ohio, Representative and Mrs. Burleson of Texas, Mr. and Mrs. Ernest G. Walker, Mr. Frederick Emery, Representative and Mrs. Charles F. Scott of Kansas, Mr. Edgar G. Snyder, Senator Newlands of Nevada, Mr. Lloyd C. Griscom, American Minister to Japan, and Mrs. Griscom, Representative and Mrs. William Alden Smith of Michigan, Senator and Mrs. Clarence D. Clark of Wyoming, Mr. and Mrs. George Rouzer, Representative and Mrs. Henry C. Adams of Wisconsin, Mr. Charles Denby, Third Assistant Secretary of State, and Mrs. Denby, Gov. Wright of the Philippine Islands, Mr. Rennie, secretary of the British Embassy; Mr. R. N. Oulahan, Mr. and Mrs. Theodore W. Noyes, Maj. Joseph E. Kuhn, Representative and Mrs. Graff of Illinois, Mr. and Mrs. Rudolph Kauffmann, Miss Lilian Whiting, Mr. Albert F. Ferguson, Linnie M. Bourne, Dr. W. Duncan McKim, Mrs. McKim, Professor and Mrs. Bigelow, C. Heurich and Mrs. Heurich, Representative F. W. Mondell of Wyoming, J. T. Hendrick, Victor H. Olmsted, William Simes, Mr. and Mrs. F. H. Bethell, Dr. Arnold

A. Hague, Rev. J. A. Aspinwall, Mr. and Mrs. John Joy Edson, General William Crozier, Crosby S. Noyes, F. A. Richardson, H. E. Waemickey, John Holmes Magruder, Thomas Edwards, Jr., and Mrs. Edwards, Major Achilles Pederneiras and Mrs. Pederneiras, Col. Henry F. Blount, Martin A. Knapp, President of the Interstate Commerce Commission; John Cassels, Miss Anna Campbell, Claude N. Bennett, Col. N. Raspopoff, J. W. Titcomb, Samuel Spencer, president Southern Railway; Eliza R. Scidmore, Mr. and Mrs. A. B. Browne.

President and Mrs. Willis L. Moore, Mr. and Mrs. H. E. Williams, Frank Sutton, Gen. and Mrs. J. C. Bates, J. Hubley Ashton, Mr. and Mrs. J. L. Davenport, Simon Newcomb, Mrs. Elizabeth S. Moore and Miss Moore, Judge Thomas H. Anderson, Gena Russell Harding and Mrs. King, Mr. and Mrs. Henry Gannett, Marvin F. Scaif and Mrs. Scaif, Mr. and Mrs. T. H. Aldrich, Mr. and Mrs. Wm. H. Baldwin, Dr. and Mrs. David T. Day, Lewis Jordan, Mr. and Mrs. H. K. Fulton, Mr. and Mrs. Andrew B. Graham, Mr. and Mrs. George B. Welch, Dr. and Mrs. George F. Becker, Prof. A. J. Henry, Dr. and Mrs. Chas. E. Stone, Gen. A. W. Greely, Mr. and Mrs. A. S. Worthington, Mr. and Mrs. O. P. Austin and Miss Austin, Mr. and Mrs. Odell S. Smith, Mr. and Mrs. Alexander Britton, S. F. Emmons, Prof. G. B. Garriott, Frank G. Carpenter, Mrs. L. McKee Rice, Col. Myron M. Parker and Mrs. Parker, Mr. W. J. Boardman and Miss Boardman, Gist Blair, James Lowndes, Walter W. Tuckerman, Colonel Dunwoody, Charles P. Neill, Commissioner of Labor; Mr. Charles J. Bell and Mrs. Bell, Mr. David G. Fairchild and Mrs. Fairchild, Joseph H. Bryan, Mr. Gilbert H. Grosvenor and Mrs. Grosvenor, Byron Andrews, Dr. J. Franklin Crowell, Major Casey and Mrs. Casey of Boston, John McElroy, Maurice Joyce, George H. Judd, Public Printer Stillings, John T. Granger, Warren Mitchell, John La Gorce, Miss Darby, Mrs. William Morgan Shuster, Mr. H. T. Dougherty and Mrs. Dougherty, H. W. Seymour, Miss Alisan Wilson, Gen. Anson Mills and Mrs. Mills, Mr. and Mrs. Ralston, Prof. Angelo Heilprin of Philadelphia, Mr. Alfred H. Brooks and Mrs. Brooks, Fred W. Carpenter, Representative Irving P. Wanger of Pennsylvania, and Representative J. M. Miller of Kansas.

The committee in charge of the arrangements for the dinner included Willis L. Moore, President; Thomas H. Anderson, Charles J. Bell, George Dewey, John Joy Edson, A. W. Greely, Gilbert H. Grosvenor, Martin A. Knapp, S. N. D. North, Theodore W. Noyes, Gifford Pinchot, and Eliza R. Scidmore.

A NEW DEPARTMENT

BEGINNING with our new volume, we shall conduct a correspondence department in this magazine. Questions from members of the Society who want information on matters of a geographic nature will be cheerfully received and answered as far as it is possible for us to do so. It is hoped that not only those members who are seeking information will make use of the new department, but also those members who have new or interesting facts to communicate. The membership of the National Geographic Society is so large that practically every corner of the United States, and, in fact, every corner of the globe is being watched by some member. Many of them, in their daily life, are seeing things which would be of supreme interest to the great body of our membership. It is not necessary that communications sent to us be long, in fact it is preferred that they should be as concise and brief as practicable, and illustrated whenever possible. Often a member will take or pick up a photograph which in itself will tell a story with only a line of text.

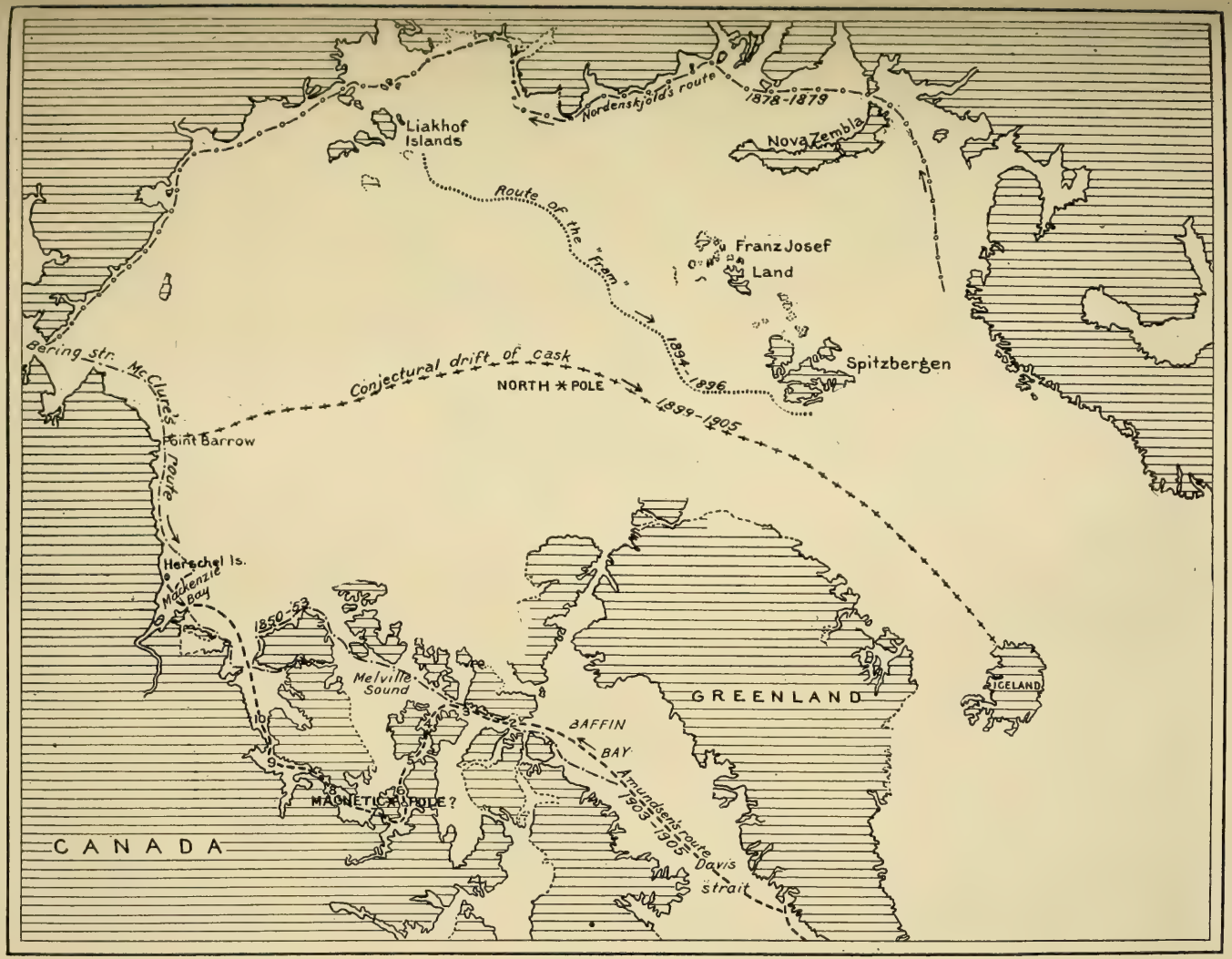
A MODERN VIKING

ROALD AMUNDSEN, the Norwegian who has just accomplished the Northwest Passage from Europe to Alaska, has performed a feat which the explorers of England and Scandinavia attempted in vain for many centuries. Scores of expeditions were lost, and hundreds of brave men perished in the endeavor to do what Amundsen in a walrus sloop, equipped with a small gasoline engine, has succeeded in doing. The old mariners fought for the Northwest Passage because they believed that it would prove a short commercial route between the East and West. The English Parliament had a standing offer of $50,000 to the man who first made the passage. The offer stood for nearly one hundred years, until McClure, in 1853, won the prize by going from Bering Sea eastward to Europe. Nobody except Amundsen has ever before made the passage from East to West. Henry Hudson was searching for it when his crew mutinied and thrust him into a tiny boat, and left him to perish on the lake which bears his name. Sir John Franklin was also seeking it when he and his 220 men disappeared, but Lieutenant Gore pointed out the opening which Amundsen has used. The route which Amundsen has definitely located will be of considerable use to whalers, who are venturing further and further north each year, but it is unlikely that anything else will come of it.

But Amundsen's achievement has much more than a romantic value. For two years he has been conducting magnectic observations in the vicinity of the north magnetic pole which Sir John Ross claimed to have located in 1831. He has now definitely fixed the position of this pole in King William Land, not far from the position ascribed to it by Ross. The new knowledge which his observations will give us of the character and influence of the magnetic pole will prove of immense value in the study of magnetic variation which is now being conducted by several observatories, particularly by the U. S. Coast and Geodetic Survey and the Carnegie Institution, under the direction of Dr L. A. Bauer. Magnetic deviation of the needle is one of the principal uncertainties with which mariners have to contend It is so important that the Carnegie Institution recently established a special department to help the magnetic survey of the world, purchasing a special ship for work in the Pacific Ocean. Terrestrial magnetism is a mysterious force. Nearly every year we have a magnetic storm which interrupts our telegraph wires for several hours. Whence it comes or what it is we know not. The eruption of Mont Pelée was accompained by magnetic waves which were simultaneously recorded in Hawaii, Alaska, United States, and Europe. All this makes the magnetic work of Amundsen particularly valuable, and we must remember that that was the principal object of his expedition.

Amundsen left Christiania in June, 1903, taking only seven men with him in his sloop the *Gjoa*. His route lay up Baffin Bay, and then through Lancaster Sound, Barrow Strait, Peel Sound, James Ross Strait, Rae Strait, Simpson Strait, Dease Strait, Coronation Gulf, and Dolphin and Union Straits to King Point, on the western side of the Mackenzie River delta.

At the Mackenzie River, where he arrived in September, 1905, he found some whalers who were caught in the ice. They told him that the political situation between Norway and Sweden was strained, and, being anxious to learn what had happened as well as to hear from his family, he determined to march south to the Yukon telegraph line. It was a 700-mile trip on snow shoes; it had been made only once or



Outline Map to show Amundsen's Route; also Conjectural Route of the Drift Cask picked up on Coast of Iceland

1. Baffins Bay
2. Lancaster Sound
3. Barrow Srrait
4. Peel Sound
5. Franklin Strait
6. James Ross Strait.
7. Simpson Strait
8. Dease Strait
9. Consolation Gulf
10. Dolphin and Union Straits

twice before by trappers, but he calculated he could get there, spend a few weeks at the station, and return to his ship before spring. So with Captain Mogg, of the whaler *Bonanza*, which had been stranded on the beach, he set out.

Four weeks later, on December 5, the people of Eagle City were startled to be told by one of two white men who came in on snowshoes that he had come from Europe via the Arctic Ocean. To cross in the dead of winter the immense expanse of ice stretching from Eagle City to the mouth of the Mackenzie alone seemed impossible, and not until the outside world identified him by telegraph would they believe that it was Amundsen.

Amundsen has announced that about the middle of January he will return to his ship at the Mackenzie River. He proposes to bring her through Bering Strait to San Francisco, and then return to Christiania by way of Cape Horn, thus completely circumnavigating the American continent. In arctic history Amundsen will rank with Greely, Nansen, and Peary.

DRIFTING ACROSS THE POLE

TWO of the drift casks which were set loose in Bering Sea at the instigation of President Henry G. Bryant, of the Geographical Society of Philadelphia, and of Admiral George W. Melville some years ago have been recovered. One of them was found on the coast of Iceland, 2,500 miles from the point where it was cast overboard on the Alaskan coast. In its tortuous course it probably traveled 4,000 miles. Its drift across the Arctic Ocean proves once more the existence of an Arctic current flowing from Bering Sea across the north polar region.

Fifty spindle-shape casks were constructed from designs submitted by Admiral Melville and were sent north on United States revenue cutters and whaling ships to Bering Strait and there dropped overboard in 1899, 1900 and 1901.

Each cask was numbered and contained a message in four languages, requesting the finder to notify the Geographical Society of Philadelphia if the cask turned up. In reporting the recovery of the casks to the Society, Mr Bryant said:

Courtesy of the New York Times

Amundsen's Ship, *Gjoa*

"An examination of the first record shows that it was cast adrift by Captain F. Tuttle, of the U. S. R. C. *Bear* on August 21, 1901, about eighty-five miles northwest of Wrangel Island and recovered by Captain A. G. Christianson on August 17, 1902, near the mouth

From a photo by Roald Amundsen, courtesy New York Times

Eskimo Women from Cape Fullerton, the Extreme North End of Our Continent

Russian Soldiers

From "Russia under the Great Shadow," by Luigi Villari. James Pott & Co. Copyright. This excellent book on Russia was reviewed at length in our last number by General A. W, Greely, U. S. A.

of Kolyuching Bay, on the Siberian coast. It is evident that this particular cask did not get a good start, and in the one year less four days of its drift the course it followed of 380 miles to the southeast was probably influenced by local currents which exist near Bering Strait.

The other representative of this silent fleet which has been traversing the desolate wastes of the Arctic seas had a longer voyage and doubtless a more eventful history. Placed on the flow ice northwest of Point Barrow, Alaska, in latitude 71 degrees 53 minutes north and longitude 164 degrees 50 minutes west by Captain B. T. Tilton, of the steam whaler *Alexander,* on September 13, 1899, it was recovered one mile east of Cape Rauda Nupr, on the northern coast of Iceland, on June 7, 1905.

More of the casks have come through, but have not been found, while others, no doubt, have been found, but not reported. There is no telling how long the cask found on Iceland drifted about in open water before it was cast ashore.

Photo by Frank G. Carpenter

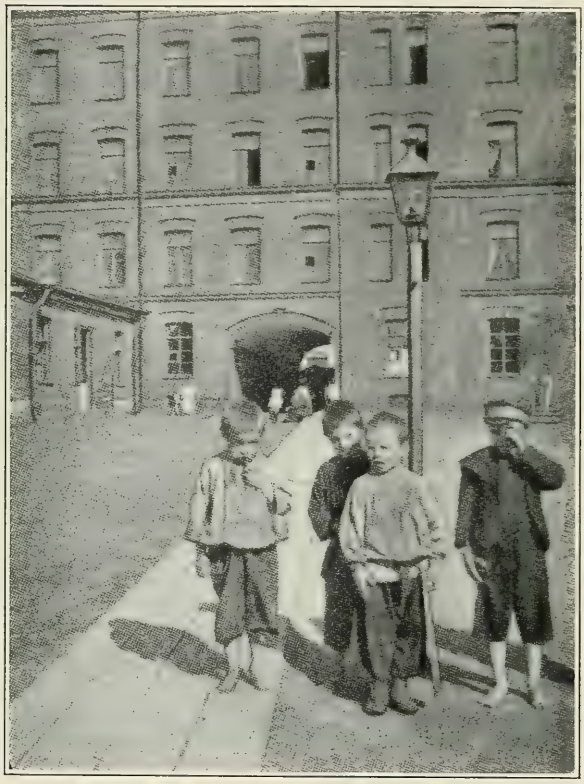
A Group of Russian Peasants

Photo by Frank G. Carpenter

A Group of Young Russian Peasants

Types of Russian Workingmen

From "Russia Under the Great Shadow" by Luigi Villari, James Pott & Co., New York, Copyright. The several Russian pictures are chosen to illustrate types of the Russian people. In the political and social troubles which have overwhelmed that country we must not forget that the Russian people are a strong, stalwart and brainy race who are fully capable of working out their own salvation.



Factory Children in South Russia

"Russia Under the Great Shadow," by Luigi Villari. James Pott & Co. Copyright.

THE BLUE CRAB

FOR rapidity of digestion the hard-shelled or blue crab is probably unsurpassed. The crab disposes of its food so quickly that its stomach is usually found to be perfectly empty within a few minutes after having had a full meal. The common assertion of fishermen, however, that the crab does not retain its food in its stomach at all, has been disproved by dissection, says Mr W. P. Hay in a special study of the life history of the blue crab which has been recently published by the Bureau of Fisheries. A large hardshelled crab if captured and held by one leg will snap the limb off and make its escape. The break always occurs at the same point across one of the segments near the base of the leg and is a protection of nature to prevent the animal from bleeding to death. If its leg is injured it will drop it off in the same way. At the first molt after a limb has been cast off the new limb appears as a small bud in which all the missing segments may be found coiled in an elongate spiral. At the next molt the segments straighten out and the new limb, except for its size, looks like the one which was cast off. Another molt, possibly two, will be sufficient to restore the limb to its full size. Regeneration of the limbs will not take place more than two or three times.

GEOGRAPHIC LITERATURE

The Effects of Tropical Light on White Men. By Major Chas. E. Woodruff, Surgeon U. S. Army. Pp. 358. New York and London: Rebman Company. 1905.

Dr Woodruff advances here a startling theory that light is a curse. He is keenly aware that he is antagonistic to all the teachings of the medical profession. Hence he girds on his scientific armor in the first part of his volume, and treats very technically of the effects of light upon life, both plant and animal, finally reaching the basis of his thesis, that the color of man's skin is directly proportioned to the "intensity of the light of the country to which his ancestors approved their adjustment by centuries or millenniums of survival in health and vigor." Thus we find all gradations of color, from the black in the tropics to the blonde in northwestern Europe. It is nature's method to guard against the destructive rays of the sun by layers of pigment over the body.

Having found his hobby, he rides it hard. Life in cities is injurious, not because of little light, as we have been generally taught, but because of the reflection from the walls and pavements. The farmer is guarded by the trees and vegetation. We are fanatics demanding so many windows in our school rooms. The less light, the less deaths from Florida to Vancouver. Instead of swearing at the clouds and rain, the people on the North Pacific coast of our land should thank God that they are protected from His sunshine.

Of the four great races, black, yellow, olive, and blonde, each has its zoological zone. Only death awaits the one that crosses its boundaries, northward or southward, but they can migrate along the parallels of latitude as they desire. Armed with his theory, Dr Woodruff confidently solves the greatest problems. The half-breeds disappear because they are too dark for the upper latitude and not dark enough for the lower ones. There is no need for alarm over the race issue among us, as the negro is doomed to extinction. The same sad fate awaits the white people who go too far southward. It is an absurdity to speak of whites being acclimatized in the tropics, as they can never fit themselves to the warmth of those regions. His explanation of our nervousness as compared with Europe is very pat. We have got too far southward of our original home, and are thus leading an existence unnatural for us. We shall all become brunettes unless constantly infused with the blonde from Europe. Our mothers and those in New Zealand cannot nurse their babies, because our race is degenerating, paying the penalty for migrating toward the equator.

But Dr Woodruff looks deeper than the skin. With him difference of color carries grades of intellect. The blondes are the brainiest, as they developed under the harsher natural conditions that would produce the best type by selection. It was early waves from that dark corner in Europe that made Greece and Rome the pagan stars of antiquity, and those nations declined when the masterful northerners became extinct under the fiercer rays of the sun. They have kept up this spirit, and today rule large stretches of the tropics, but can never exterminate those black and brown subjects, as the heat there saps the blonde vitality in three generations. These later blondes are largely Protestants, because that system means independence of thought, while southern Europe is Catholic and brunette. The United States is in the Semitic or olive belt, and we shall become mostly brunette, but the superior blonde will always be our captains.

Even our theaters in large cities show the superiority of the blonde in the audience. The lower class houses are filled largely with brunettes every evening, while the better ones appeal to the blonde.

But there are gaps in Dr Woodruff's logic. He is confused on the origin of the blondes. He does not explain why the Japanese are yellow, though they live up in the olive latitudes. As an offset he is very ingenious in accounting for the golden hue of the Esquimo, on the ground that they receive extra light from the glare of the snow. Again he flies in the face of authority in denying the existence of Aryans in India today, but not a shadow of proof does he offer for his flat contradiction of the general view. He speaks of the negroes suffering so much from pulmonary troubles, oblivious of the fact that in slavery days they were almost free from those diseases. He points out the deterioration of families in Maryland, but says nothing about the vigor of those in Virginia. He calls attention to the weakness of physique in the lower south, forgetting the strength and virility of those same people forty years ago in the Civil War.

It is a most stimulating, even disquieting, investigation. Traditions are forcibly assailed, conclusions that are almost axioms among educated people are contemptuously tossed aside. Dr Woodruff may be right in his iconoclasm, but he should be more logical and more systematic in the arrangement of his evidence.

C. MERIWETHER.

Extinct Animals. By E. Ray Lankester, M. A., LL.D., F. R. S. Illustrated. Pp. 331, 218. New York: Henry Holt and Company. 1905.

This book is the best popular description of an obscure realm of science in existence. With the simplicity of language, and clearness of arrangement, suited for lectures to a juvenile audience, Mr Lankester combines enough technical knowledge to make his subject highly interesting to educated adult readers. Besides entertaining accounts of animals lately extinct, we have representative types of the great families, such as elephants, horses, reptiles, birds, and fish. There are more than 200 well-executed illustrations and a most comprehensive index. C. M.

In the Land of the Strenuous Life. By Abbe Felix Klein. Illustrated. Pp. 387. Chicago: A. C. McClurg and Company. 1905. $2.50 net.

Just about three years ago this eminent professor from the Catholic University of Paris reached America, and then for the next nine months or so was very active in traveling over the upper eastern half of the United States and a part of Canada, observing life among us and gathering data for the impressions he has given us in the above volume. Naturally for an ecclesiastical teacher, two special fields interested him—religion and education. Remarkably for a student, he has embodied very interesting accounts of business and industries. Most properly he enlarged considerably upon his Washington experiences, and notably his acquaintance with President Roosevelt.

He is very cheerful about the work and prospects of his own church in the United States. He finds here a more earnest spirit than in Europe among all nationalities except the Italians, who are very slack in their faith. He has much praise for our schools and colleges. There is a very lively and enthusiastic account of a visit he made to the colored high school of Washington. He is really amazed at the progress made by that race in learning from books, but he is very profound in his reflections upon the destiny of those dark people in this land. There is no short road to culture for them, as there was

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Harbor of Rio

From "A Commercial Traveler in South America." by Frank Wiborg.

none for the white, and Prof Klein declares that they will have to go through the painful centuries of evolution before they can reach the standard of their white fellow citizens. He emphasizes very strongly the industrial side of training for them, though he thinks the higher courses are necessary for a small class of picked leaders.

He has a very keen eye. In the rush and roar of manufacturing in Pittsburg, he discovers that the farm must produce the men who are to manage the great throbbing activities of our large cities.

A whole chapter is devoted to Mr Roosevelt, one of whose books really furnishes the title for Professor Klein's discourse. He is naturally full of admiration for this great representative of America, but makes one mistake of fact when he refers to him as at one time a member of Congress.

From cover to cover, the pages hold the closest attention. Here we have the lively opinions of a genial foreigner, mixed with as few errors as could be expected from a short trip. There is nothing of patronage, nothing of captious criticism, but the frank earnestness of a man who looks with clear vision upon what he comes across. He does not bubble over with praise of us, but he realizes what an immense brother we are among the countries of the world. C. M.

The Land of the Rising Sun. By Gregoire De Wollant. Translated by the author with the assistance of Mme. De Wollant. Pp. 400. 5½ x 8 inches. New York: Neale Publishing Co. 1905.

"The Japanese Archipelago or Dai-Nippon (Nihon) stretches like three garlands of a vine along the coasts of Siberia and northern China" are the opening words of an extremely inter-

esting and comprehensive book on Japan by a Russian. Mr De Wollant, Charge d'Affaires at Mexico, was stationed for some years in Japan, so that he had excellent opportunity of studying the country, the people, and their customs, and was able to visit many places not frequented by tourists. He speaks of seeing beautiful camellias "which do not resemble much our poor hothouse plants, for in Japan the camellia is a large tree with a thick trunk, and there are whole forests of them. The camellia is so plentiful that it is used as firewood." Speaking of a dinner given him by the governor of Kumamoto, he says: "The menu was varied and plentiful. With the champagne the governor made a speech. He asked our pardon for the bad country meal. That is always the order of things in Japan, and it is remarkable how the Japanese always speaks of himself and of all which belongs to him in such a deprecatory manner. He always speaks of his tumbled-down house, of his business as bankrupt, and of his wife as stupid." On the whole Mr De Wollant's account is fair and impartial, and although we may differ with him in his conclusions and his account of the differences betwen his country and Japan, we are glad to hear the Russian side of the controversy. In conclusion he says: "If they (Japanese) should succeed in breaking this power (Russia) or even weakening it, and thus raise the prestige of Japan in all Asia, that would already be a great result. Then would follow the turn of other nations, for has not Germany, Shantung, England, Wei-hai-wei and Hongkong, etc. Let there be no illusion! We are living through a significant moment of human history and are contemplating the first act of the struggle of Asia against the European spirit." The one fault of the book is the absence of an index. E. M. G.

A Commercial Traveler in South America. By Frank Wiborg. Illustrated. New York: McClure, Phillips & Co. 1905.

This little book contains a description of a flying visit across the Isthmus of Panama and along the coasts of South America.

In Valparaiso "the conductors are women. It seems that during the war against Peru such a large percentage of men and youths were drafted into the army that the women who were left alone had to do men's work as best they could. As conductresses they proved so satisfactory and honest that they have been retained ever since. The platforms of the cars are all furnished with a small seat for the conductress."

With Flashlight and Camera. By C. G. Schillings. Translated and abridged by Henry Zick. Illustrated. Pp. 434. New York: Harper & Brothers. 1905.

During two journeys into Central and East Africa, Mr Schillings succeeded in making more than a hundred telephotographs of birds and animals largely by flashlight. The reproductions are of value and interest both to hunters and students. Those of lionesses stalking and springing on their prey are the most striking. Twelve species of animals are represented, the most valuable studies being of elephants, lions, the hippopotamus, and rhinoceros. The translation scarcely equals the literary qualities ascribed to the original A. W. G.

The Indian Dispossessed. By Seth K. Humphrey. Illustrated. Pp. 298. 7⅝ x 5 inches. Boston: Little, Brown & Co. $1.50 net.

No one can read without indignation this story of repeated injustice to peaceful reservation Indians. Unwise if not corrupt legislation, harsh, il-

liberal enforcement of the law, sharp business practices—such are the means and methods herein recited. Painful as are the facts, it is unreasonable to inculcate, as does the author, a "persistent distruct of Congress." The volume should stimulate public demand for equitable treatment to which the present Indian administration is fully pledged. A. W. G.

OBITUARY—VON RICHTOFEN

IN the death of Ferdinand Freiherr von Richtofen (1833-1905) geographical science loses one of its most distinguished representatives. A student of Carl Ritter, Richtofen has been actively engaged in geographical investigation for half a century. His activities have been remarkable, covering the Austrian mountain ranges, Ceylon, Java, Formosa, Siam, the Philippines, Japan, China, and California. While all his works are marked by acumen, thought and clearness, his general fame will rest on his great memoir on the geomorphology, paleontology, geology, and world relations of China and Inner Asia. Unfortunately Richtofen left unfinished this great study of one of the richest and least known regions of the world. His services at the head of the Berlin Geographical Society, and as President of the Seventh Geographical Congress, Berlin, 1899, made him personally known to many of the members of the National Geographic Society. In his high position as Rector of the University of Berlin he crowned with glory a career as explorer, investigator, and teacher. He was always a leader, following intuitively lines of thought and research productive of definite and reliable results.

To intellectual ability were conjoined in Richtofen highest qualities of moral and social order. His charm of manner, graciousness of character, courtesy of intercourse, and considerate treatment of associates, endeared him to every one favored by his acquaintance or friendship. As a man and scientist he added much to his age, and leaves to the future high standards for incentive and emulation.

A. W. G.

CORRESPONDENCE

NEW YORK, *December* 14, 1905.

Editors National Geographic Magazine.

DEAR SIRS: Will you kindly inform me where I can get data regarding Lower California? (I refer to the Mexican territory of that name.) The data that I wish is in regard to the soil, its natural irrigation, climate, and such other facts as it is necessary to know for colonization purposes.

I would thank you very much to refer me to any publication that will give this data, or to any persons to whom I could apply who might be conversant with that country.

Very truly yours,

X. Y. Z.

Lower California has no inhabitants to speak of except near the United States border. Americans own most of the territory. Proposed colonists would have to consider very seriously the question of water. The Colorado River, which flows through the territory, was very recently diverted and almost all of the water, or 90 per cent, is now flowing into Salton Sea. One year ago Salton Sea was a salt bed (dried-up lake) where manufacturers plowed up salt. It has now become a great lake, 800 miles square, and is rising at the rate of one inch a day; the imperial value of California itself is threatened. This diversion of the Colorado River was due to the bungling of some engineers (not government engineers) who tried to divert the channel of the river. The river got away from them and started down for Salton Sea, a former lake, refusing the direction desired by the engineers. They are having quite a time trying to get the river to flow back to the ocean, and may or may not succeed. Meanwhile Lower California is cut off from most of its water.

The Colorado River bottom lands, just across the Mexican territory, are wonderfully fertile; eight crops of alfalfa can be obtained yearly. Their large value depends of course on the annual inundation of the river, and if this inundation is to be prevented by the diversion of the Colorado, the lands become of little value. Not much is known of Lower California except in the region of the Colorado River delta, where, as has been said,

Plowing up Salt in the Sea of Salton, which has now Become a Vast Lake

The bed is about 300 feet below the level of the ocean, and forms the lowest part of the Imperial Valley of California, which centuries ago was a part of the Gulf of California.

the land is wonderfully rich. The rainfall throughout Lower California is sparse. Practically nothing of real value has been written on the country. Mr J. B. Lippincott, engineer Reclamation Service, Los Angeles, California, probably knows more about the country than any one else.

ST LOUIS, MO., *November* 21, '05.

Editors National Geographic Magazine.

DEAR SIRS: Is not the statement by Sir William Wharton in the November number, page 488, that the circumference of the earth is 21,600 miles in error? Is it not about 25,000?

Yours truly, A. W. D.

The equatorial circumference of the globe is approximately 21,596.11 geographical or nautical miles or 24,900 statute miles. The polar circumference is approximately 21,534 geographical or nautical miles or 24,818.64 statute miles.

GALLUP, NEW MEXICO, *December* 20, 1905.

Editors National Geographic Magazine.

DEAR SIRS: Will you kindly advise me of the name of the most complete and reliable book or books on geology?

Yours truly, G. MULHOLLAND.

Joeph Le Conte: "Geology." New edition, edited by H. L. Fairchild. 1903. D. Appleton & Co. $3.00.

T. C. Chamberlin and R. D. Salisbury: "Geology." 2 vols. Henry Holt & Co. 1904. $4.00.

PLAINFIELD, N. J., *December* 7, 1905.

Editors National Geographic Magazine.

DEAR SIRS: Will you kindly inform me what is the highest latitude that has been reached by any explorer in search of the North Pole?

Yours truly,

ERNEST R. ACKERMAN.

Abruzzi, 86° 33′, 1900.
Nansen, 86° 14′, 1895.
Peary, 84° 17′, 1900.
Greely, 83° 24′, 1882.

GEOGRAPHICAL SQUIBS

First Explorer: "We are in terrible straits. The supply of champagne is reduced to 13 cases, the cigars are nearly gone, and the mineralogist is half dead with gout." "Cheer up, old man, the third relief party is due this month."—Life.

"Which is farther away," asked the teacher, "England or the moon?"

"England!" the children answered quickly.

"England?" she questioned. "What makes you think that?"

"'Cause we can see the moon and we can't see England," answered one of the brightest of the class.

Little Rob was the prize geographer of his class; that is, he could locate cities and bound countries with great glibness. He could draw the most realistic maps, printing in the rivers, mountain ranges and cities from memory. Rob considered geography purely in the light of a game, in which he always beat, but he never associated it with the great world about him. Rivers to him were no more than black, wiggly lines; cities were dots, and states were blots. New York was green, Pennsylvania was red, and California was yellow. Of course, Rob had never traveled. He was born in a canyon near the country school he attended. One day the teacher made the discovery of Rob's idea of geography through the following incident: After vainly inquiring of several of the children where British Columbia is located, she called on Rob, who, as usual, was waving his hand excitedly, wild with the enthusiasm of pent-up knowledge.

"It is on page 68," he declared.

After the roar had subsided the teacher explained that that was only a picture of British Columbia. Then she asked Rob to bound British Columbia.

"Can't, teacher; it's all over the page."

—Success Magazine.

Fred B. Smith, the Y. M. C. A. worker, who has just returned from a trip around the world and who remained in Washington several days last week, tells a good story of Australia. Before he started, he told a friend of his proposed trip and said that he planned to visit Australia last.

"That's good," remarked the friend. "Because an American always feels at home there."

The traveler met another friend in England and told of his prospective visit to Australia.

"Yes, that's fine," was the comment. "An American always feels at home in Australia."

Meeting another friend from this country in India, he stated that he intended to visit Australia and then go home.

"When you get to Australia, you will feel as if you were home," remarked the friend.

"Why is it that Australia is so much like America, as every one tells me?" asked Mr Smith. The friend thought a moment, rubbed his hands together briskly, and replied:

"Well, they brag down there just the same as we do in America."—Washington Star.

NATIONAL GEOGRAPHIC SOCIETY

POPULAR MEETINGS

National Rifles' Armory, 920 G Street

January 5—"Russia and the Russian People." By Mr Melville E. Stone, General Manager of the Associated Press.

It will be remembered that it was Mr Stone who two years ago persuaded the Czar Nicholas to grant freedom from the censor to foreign correspondence from St Petersburg.

January 19—"An Attempt at an Interpretation of Japanese Character." By Hon. Eki Hioki, First Secretary of the Japanese Legation.

January 25—"The Ziegler Polar Expedition of 1903–1905." By Messrs W. S. Champ, Anthony Fiala, and W. J. Peters.

February 2—"Austria Hungary." By Edwin A. Grosvenor, LL. D., Professor of International Law in Amherst College, author of "Constantinople," "Contemporary History," etc.

February 10—"A Flamingo City." By Dr Frank M. Chapman, of the American Museum of Natural History. Illustrated.

February 16—"Africa from Sea to Center." By Mr Herbert L. Bridgman. Illustrated.

Africa in transition today challenges the attention of the world. Few intelligent Americans know to what extent its possibilities have been developed since Livingstone's day, a development that in rapidity promises to exceed that of North America.

February 20—"China." By Hon. Charles Denby, of the State Department, and for many years resident in China.

February 23—"The Personal Washington." By Mr W. W. Ellsworth, of the Century Company. Illustrated.

This is not a lecture in the ordinary sense of the word, but it is an exhibition, through the medium of the stereopticon, of the greatest collection of prints, manuscripts, and letters referring to the personal side of Washington ever brought together.

March 2—"Our Immigrants: Where They Come from, What They Are, and What They Do After They Get Here." By Hon. F. P. Sargent, U. S. Commissioner General of Immigration. Illustrated.

March 16—"Oriental Markets and Market Places." By Hon. O. P. Austin, Chief U. S. Bureau of Statistics. Illustrated.

March 30—It is hoped that official business will permit the Secretary of the Navy, Honorable Charles J. Bonaparte, to address the Society on "The American Navy."

April 13—"The Regeneration of Korea by Japan." By Mr George Kennan. Illustrated.

SCIENTIFIC MEETINGS

Hubbard Memorial Hall, 8 P. M.

January 12—Annual meeting. Reports and elections. "Progress in the Reclamation of the West." By Mr F. H. Newell, Chief Engineer Reclamation Service.

January 26—"The Carnegie Institution." By President R. S. Woodward.

February 9—"The Introduction of Foreign Plants." By Mr David G. Fairchild, Agricultural Explorer, U. S. Department of Agriculture.

February 24—"Hunting with the Camera." By Hon. George Shiras, Member of Congress from 3d District, Pennsylvania.

March 9—"The United States Bureau of the Census." By Hon. S. N. D. North, Director.

March 23—"The Death Valley." By Mr Robert H. Chapman, U. S. Geological Survey.

April 6—"The Total Eclipse of the Sun, July, 1905, as Observed in Spain." By Rear Admiral Colby M. Chester, U. S. N., Superintendent U. S. Naval Observatory.

April 20—"The Protection of the United States Against Invasion by Disease." By Dr Walter Wyman, Surgeon-General Marine Hospital Service.

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The NATIONAL GEOGRAPHIC MAGAZINE

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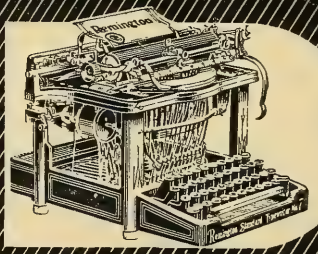

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VOL. XVII, NO. 2 WASHINGTON FEBRUARY, 1906

THE NATIONAL GEOGRAPHIC MAGAZINE

THE PANAMA CANAL*

BY HON. THEODORE P. SHONTS

CHAIRMAN OF THE ISTHMIAN CANAL COMMISSION

An article by Mr Shonts was published in the December, 1905, number of this Magazine, describing the sanitary revolution on the Isthmus and the enormous purchases of supplies, 61 steam shovels, etc. The present paper explains the experiments with foreign labor, the arrangements for equal transportation facilities, and other questions not previously described.

IT is a pleasure to speak of the Panama Canal in the home of Secretary Taft, and to an assemblage of his neighbors and friends. He is a son of Cincinnati and of Ohio in whom the whole country takes pride, for his services on the bench, in the Philippines, and in the government at Washington have brought honor, not only to his native city and state, but to the American name before the world. I consider it a high privilege to be associated with him under the direction of President Roosevelt in the conduct of the most stupendous enterprise to which this nation has ever put its hand. He brings to this task the broad intellectual grasp, the calm, clear judgment, the complete patriotic devotion, and the inflexible, uncompromising, and outspoken honesty that are the distinguishing traits of his public career. The value to the country of the services of such a man in its government cannot be overestimated. When the canal shall have been completed—as completed it surely will be—no small share of the credit for the great achievement will be due to his wise counsel, inspiriting coöperation, and unflagging faith in the ability of the American people to solve any problem with which they are confronted.

I am here tonight to talk, as I have said, not of an experiment, but of an assured success. We are not merely going to build the Panama Canal—we are building it. Preparation is a part, and a most important part, of the work of construction. When that shall have been fully and thoroughly accomplished, a great step forward will have been taken. You cannot erect a house until you have laid the foundation. You cannot run a railway until you have laid the tracks. You cannot build a chimney by placing the top bricks first. These are trite tru-

* An address to the Commercial Club, Cincinnati, Ohio, January 20, 1906.

isms, but there seem to be people in this country to whom they are novelties. We are approaching the end of the preliminary work. We have made the Isthmus a healthful place in which to work. We are getting the line of the canal into a condition which will enable us to operate an excavating plant to the best advantage, and we are assembling the plant with which the work is to be done. When you bear in mind that we have been engaged in this preparatory task barely six months, that we have been compelled to carry it forward in a tropical country, mainly a wilderness, not accessible by railway, but 2,000 miles at sea and 2,000 miles from the base of supply, and that most of the material entering into the work had to be manufactured to order before it could be shipped to the scene of action, I think you will admit that the amount of time consumed has not been unreasonable.

I shall not burden you with details of the preparatory work. These were set forth by me in a speech before the American Hardware Manufacturers' Association, a few weeks ago,* and are to be found in the recent report of the Commission to Congress. Briefly summed up, they have resulted, first, in converting the Isthmus from a hot-bed of disease into as healthful a place for work of the kind in hand as could be found in any tropical country—with reasonable care a man can go there to live now with no more serious menace to his health than he would encounter in frontier work in our own country; second, the workers of all grades are provided with suitable and sanitary quarters, wholesome food in abundance and at reasonable prices, and pure water; third, an antiquated, inadequate, and poorly manned railway system has been improved and reorganized on modern lines, and provided with up-to-date equipment of locomotives and cars; fourth, new wharves equipped with modern mechanical appliances, commodious terminal yards at both ends of the railway, extensive warehouses, suitable machine shops, and a modern coal-hoisting plant are rapidly approaching completion; fifth, more than $9,000,000 has been expended in the purchase of supplies and material, largely for an operating plant in the actual work of excavation, and the bulk of this investment is already on the Isthmus.

* Published in the National Geographic Magazine, December, 1905.

SUPPLIES WERE BOUGHT IN THE UNITED STATES

This vast quantity of supplies has been purchased almost exclusively in the United States. In accordance with our policy of buying in the cheapest markets, we have bought chiefly in the United States because its markets, in the main, are the cheapest in the world for the products that we need in this work. The American laborer is the highest priced in the world, but we can buy the results of his work more cheaply here than abroad, because of his superior skill and because of the intelligent interest which he as an American citizen takes in his work. In other words, he puts more brains into the product of his hands, because he is a citizen of a free country and his mind has been enlarged and his ambition stimulated by active participation in the duties of citizenship.

While buying our supplies in the United States we have seen to it that the entire country should be admitted on equal terms to the competition for furnishing them. Our theory is that since the American people are to defray the cost of building the canal, the whole American people should be treated alike in the opportunity to derive legitimate industrial and commercial profit from the outlay for construction. One of the first acts of the present Commission after taking office was the adoption of a policy designed to place all manufacturers and producers in all parts of the country on equal terms in regard to shipments of

goods to the Isthmus. The chief features of this policy were:

TRANSPORTATION MONOPOLIES TO THE ISTHMUS HAVE BEEN ABOLISHED

(1.) We threw open all terminal facilities on the Isthmus to all steamship lines on equal terms. Prior to this time the Panama Railroad, being a private and not a government corporation, had endeavored to force the shipment of all canal supplies by way of New York. The management of the railroad required that steamship lines from Gulf ports should charge the same rates from their ports to Colon as were charged by the railroad's steamship line from New York to Colon, under penalty of being deprived of the railroad's dock facilities at its terminals.

The result of this was to give great advantage to the port having the shortest rail line from point of production. As New York was much nearer the centers of production than Gulf or Pacific coast ports, it secured the bulk of the business. When the government assumed control, by purchase, of the Panama Railroad, one of the Commission's first acts was to notify all steamship lines that they could have the use of the railroad's terminal facilities on the Isthmus on the same terms as the steamships of the railroad company, without regard to any rates they might make from their ports of departure.

(2.) We required all bids for supplies to be made c. i. f. the Isthmus—that is, all bids to include cost of delivery on the Isthmus.

(3.) In order to prevent any charge of discrimination in rates, as between New York and the Gulf and Pacific coast ports, we separated the Panama Railroad Steamship Line from the Panama Railroad and threw open the use of that steamship line to all railway connections at New York on agreed percentage divisions. We gave our direct rail connections at New York, as well as all others, the privilege to make rates from all producing territory clear through to Colon. Under this policy the manufacturer situated on the line of a railroad leading to New York has no advantage whatever over the one situated on lines of railway running to Gulf ports. Each can arrange for his own rates straight through to Colon. We went a step further and adopted the policy of charging the government on the Commission's shipments from New York exactly the same rates that are paid by any other shippers from that port locally. Our object in these various acts was to protect the United States government from any charge of favoritism to any section of the country or to any port.

If we had made low rates from New York on our own materials it would have been charged that these were less than private capital could afford to grant, and that therefore the government should install similar service from the South Atlantic and Gulf ports. We should also have been charged with rebating to ourselves as against other shippers, thus violating the law. What we did was to put the government on a parity with every other shipper, and all sections of the country on exactly the same footing. If by reason of these policies competition among the railways in different sections of the country shall result in rates below a profitable basis, the government will be the gainer, because it will get the benefit of a reduced cost in the price of its material delivered on the Isthmus. In no case can the government be a party to any kind of discrimination.

You, gentlemen, being situated about equally distant from the Gulf and the seaport, are especially favored under this policy. You will get the benefit of the competition of the railways leading through both gateways, and should be able to secure very reasonable rates of transportation on any goods you may produce and desire to sell which enter into the construction of the canal.

LABOR IS THE DETERMINING FACTOR

I come now to a branch of this subject to which I have referred in my address before the Manufacturers' Association, and also in the Commission's report to Congress, and I bring it up again because there is nothing connected with the construction of the canal that surpasses it in importance in its bearing on results. I refer to the labor question.

The character of labor employed on the Isthmus has more to do with the time it will take to build the canal—more to do with the cost of construction—than any other determining factor.

There is no insuperable difficulty in the way of the construction of the canal from an engineering point of view and with any ordinary class of labor. The serious problem is to get what will be considered in this country anything like an ordinary class of labor. In examining this question we have studied and discussed the merits of labor of nearly all nationalities available for the purpose. The chief difficulty with which we have to contend in the employment of oriental labor, lies in the laws which hedge about its use. In order to comply with the letter and spirit of these laws, the best that we can do is to let out the work by contract, advertise and secure the lowest bidder, who will be nothing more or less than an agent. He will secure the labor, deposit the money required by the government of the country from which the laborer comes for the sustenance necessary to the support of his family while he is away, and advance the money for the necessary transportation. All this is to be included in the cost of the labor delivered on the Isthmus, in addition to the agent's remuneration, making it very high-priced. The government must protect itself against the charge of forcing involuntary servitude, and hence it can adopt no safeguards which will prevent the labor from leaving the Isthmus the day after arrival, thus losing the money necessary to get it there, with no return whatever. The result of this is practically to make oriental labor prohibitive in the construction of the canal.

EXPERIMENTS WITH ITALIANS, SPANIARDS, AND WEST INDIANS

Experiment with Italian laborers, while not made on a large scale, has not been satisfactory, for the reason that they do not seem possessed of great vitality and succumb quickly to tropical fevers.

The West Indian negro that we are using has but little life and ambition in him. We are practically trying to wield an inert mass, with the result that we are not getting over 25 per cent or, from a most liberal point of view, 33⅓ per cent of the efficiency of the most ordinary labor in the United States. We are now arranging to experiment with 1,000 laborers from the north of Spain. This class of labor was used to great advantage by Sir William Van Horn in the construction of his 350 miles of railroad in Cuba. While not tall, they are of muscular build, docile in temperament, and willing and industrious workers, with enough ambition to want to become subforemen and foremen in their work. In other words, besides being laborers they have a spark of ambition which makes it possible to develop them into something better than brute force. These men have the further advantage of being white, and of speaking the language which most of our foremen either know or rapidly acquire after reaching the Isthmus.

So far as the labor in the United States is concerned, we might as well recognize the facts. The best quality of this labor is regularly employed, because of the great industrial activity here. This confines our selection to those employed only as extra men and those seeking employment, who of course will not grade as high as those regularly employed. In order to get these men in some branches of trade, it is necessary to pay larger wages than are paid in this country, for

they would rather have extra work, with a chance of regular employment here, than leave their own country.

THE EIGHT HOUR LAW WOULD BE AN EXTRAVAGANCE

Before closing my remarks in regard to the importance of labor in this enterprise, I wish to repeat and to emphasize the opinion I have expressed on former occasions in regard to the application of the eight-hour law. The present wage varies from 80 cents to $1.04 per day in gold. As compared with the best common labor in the United States, its efficiency is rated at from 25 to 33 per cent. Over 80 per cent of the employees of the canal are now and will continue to be alien laborers. A majority of the other 20 per cent employed will be in a clerical, a supervisory, or in some other capacity to which the various labor laws of the United States are not applicable. It is to this kind of labor we are compelled to apply the eight-hour law—that is, to aliens who know nothing of the law's existence until they arrive on the Isthmus.

Such application will increase the labor cost of canal construction at least 25 per cent. You can readily see why this will be the case. We pay our laborers by the hour. If we can employ them for only eight hours a day we can give them work for only forty-eight hours a week. If we can employ them for ten hours a day we can give them sixty hours a week. They will accept a smaller hourly wage for sixty hours a week than they will for forty-eight hours. As a matter of fact, the skilled laborers prefer a ten-hour day, and many of them have asked for it, desiring to get the extra two hours' pay. When they work overtime on the eight-hour plan they expect to get time and a half.

It is obvious that by forcing the eight-hour day upon us, millions of dollars will be added to the cost of construction. American labor in this country will have to pay its share in the consequent increase of taxation, and for no appreciable benefit, for, as I have shown you, there are only a very few American laborers on the Isthmus. There is no question of American labor involved in Isthmus work, and I repeat what the Commission has urged in its annual report, that it is a mistake to handicap the construction of the Panama Canal with any laws save those of police and sanitation, and that labor on the Isthmus should be excluded from the application of the eight-hour law, the contract-labor law, the Chinese exclusion act, and any other law passed or to be passed by Congress for the benefit of American labor at home.

As I said at the beginning of these remarks, our preparatory work is nearing completion. It has, in fact, advanced as far as we can carry it safely until we know definitely the type of canal we are to construct, whether it is to be sea level or high level. It is of the utmost importance, therefore, that decision as to this type be reached at the earliest possible moment. I had hoped when I accepted your invitation that before the time to address you should arrive the Advisory Board would have made its report, and I should be at liberty to speak freely about it, and to discuss both the details of the plan decided upon and the methods to be employed in its execution. The members of the Board consumed much more time in their deliberations than they had anticipated, and as the two reports which they have decided to make are not yet before the Commission, it would be obviously improper for me to enter upon the subject now.

THE DIGGING WILL PROBABLY BE DONE BY CONTRACT

I am glad to say, however, that whatever may be the type decided upon it will take us but a short time to complete the arrangements for beginning at once to carry its details into execution on a com-

prehensive scale. We shall divide the work into sections and prepare specifications asking for bids for contracts for such portions of the work as we think can be done advantageously in that way. We are strongly in favor of doing the work by contract if the type of canal and the prices bid will permit. One of the chief benefits we have derived from the preparatory work is the accumulation of knowledge as to the nature of material to be handled and the cost of handling it, which will enable us to judge whether or not such bids as we may receive will make it desirable to have the work done by contract.

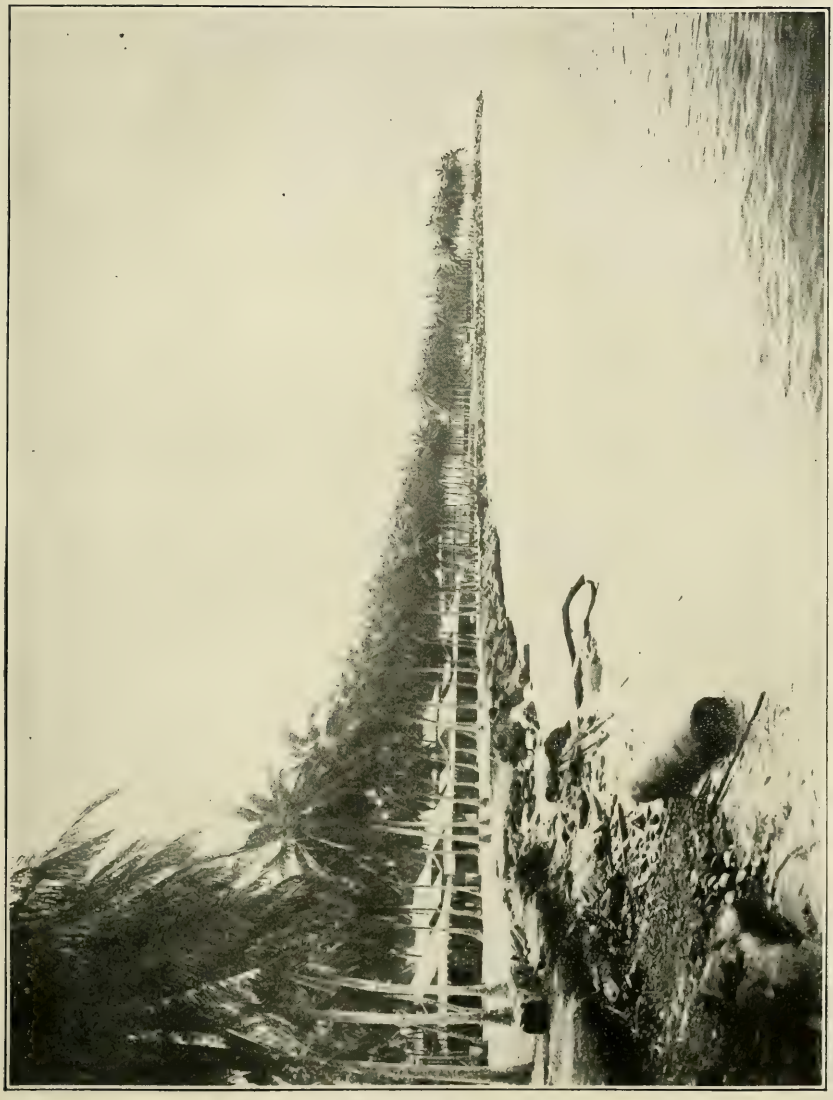
Gentlemen, we are treating this task as a great business enterprise and are seeking to accomplish it by the application of strict business methods, paying no heed to politics or political "pulls." Our sole aim and purpose is to give the American people the full worth of every dollar they put into the work, and to hand over the work completed to them at the earliest possible day. So long as we continue in control of the job it will be managed on these principles and on these alone. When it becomes apparent that we will not be permitted to build the canal in that way we will step aside and let somebody else take it in hand. In a recent message to Congress, President Roosevelt, who is the supreme director of the work, every step of which has been taken with his personal knowledge and with his approval, said:

"All our citizens have a right to congratulate themselves upon the high standard of efficiency and integrity which has been hitherto maintained by the representatives of the government in doing this great work. If this high standard of efficiency and integrity can be maintained in the future at the same level which it has now reached, the construction of the Panama Canal will be one of the features to which the people of this Republic will look back with the highest pride."

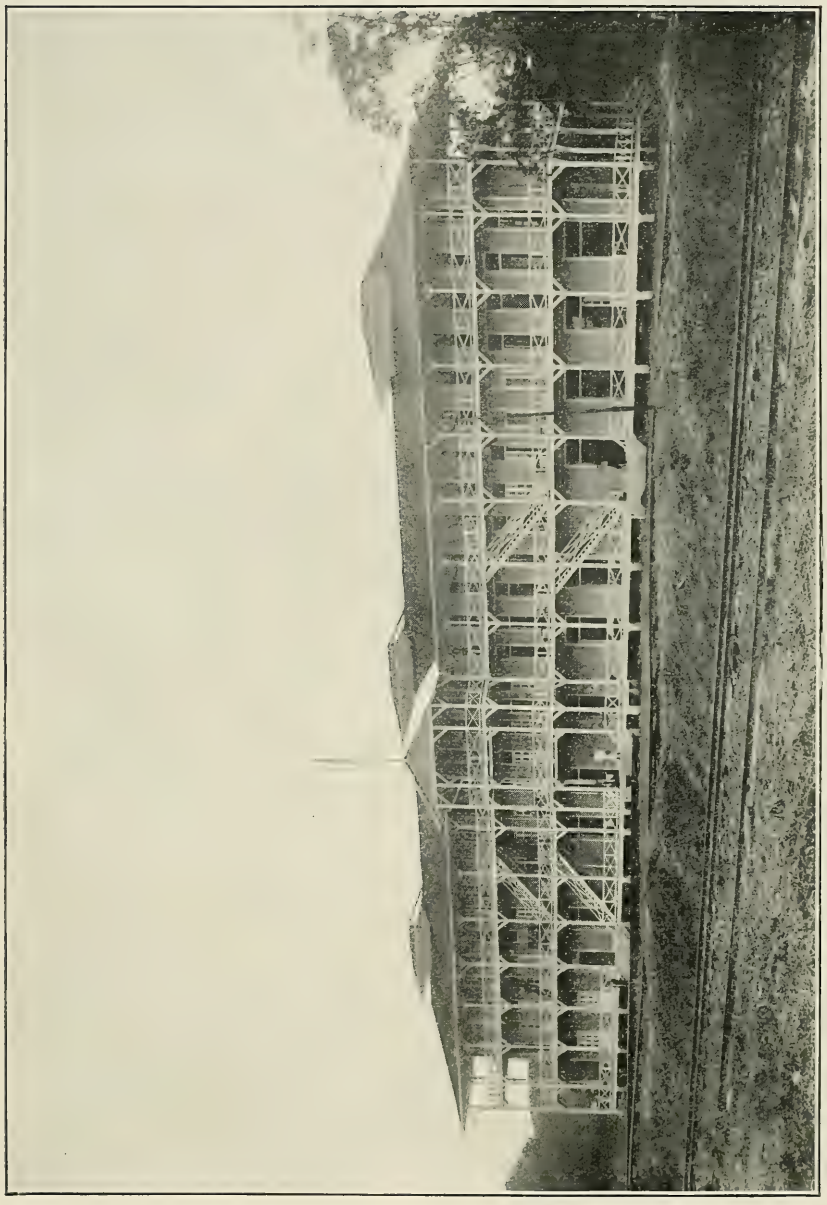
The members of the Commission and those associated with them in the task ask no higher approval than that; neither do they think that any other is necessary to carry conviction to the minds of the American people. In the same message the President also said:

"From time to time various publications have been made, and from time to time in the future various similar publications doubtless will be made, purporting to give an account of jobbery, or immorality, or inefficiency, or misery, as obtaining on the Isthmus. I have carefully examined into each of these accusations which seemed worthy of attention. In every instance the accusations have proved to be without foundation in any shape or form. They spring from several sources. Sometimes they take the shape of statements by irresponsible investigators of a sensational habit of mind, incapable of observing or repeating with accuracy what they see, and desirous of obtaining notoriety by widespread slander. More often they originate with, or are given currency by, individuals with a personal grievance. The sensation mongers, both those who stay at home and those who visit the Isthmus, may ground their accusations on false statements by some engineer, who, having applied for service on the Commission and been refused such service, now endeavors to discredit his successful competitors; or by some lessee or owner of real estate who has sought action, or inaction, by the Commission to increase the value of his lots, and is bitter because the Commission cannot be used for such purposes; or on the tales of disappointed bidders for contracts; or of officeholders who have proved incompetent or have been suspected of corruption and dismissed, or who have been overcome by panic and have fled from the Isthmus.

"Every specific charge relating to jobbery, to immorality, or to inefficiency, from whatever source it has come, has been immediately investigated, and in



Cottages Built for Married Employees at Cristobal



A Typical Hotel for Canal Employees, at Corozal

This is the hotel that was reported by a certain traveler as "built in a swamp"

Cottages for Married Employees, at Corozal

no single instance have the statements of these sensation mongers and the interested complainants behind them proved true. The only discredit inhering in these false accusations is to those who originate and give them currency, and who, to the extent of their abilities, thereby hamper and obstruct the completion of the great work in which both the honor and the interest of America are so deeply involved. It matters not whether those guilty of these false accusations utter them in mere wanton recklessness or folly or in spirit of sinister malice to gratify some personal or political grudge."

Thus speaks the President.

A notable specimen of this scandal-mongering literature was laid before the country a few days ago from the pen of a man who had spent twenty-eight hours and ten minutes on the Isthmus. The ten minutes are important, for a person of such extraordinary powers of observation and production can collect an enormous amount of material in that time. He landed at Colon on November 30 at 10 a. m. and sailed away on the same steamer from Colon at 2.10 p. m. on December 1. In those twenty-eight hours and ten minutes he accumulated a fund of exact knowledge sufficient to enable him to draw a general and sweeping indictment of the President, Secre-

tary Taft, the Canal Commission, Governor Magoon, Chief Engineer Stevens, Colonel Gorgas, and everything that has been done on the Isthmus since the American government came into possession of the Canal Zone.

A MISSTATEMENT

He has been not merely answered but annihilated by Secretary Taft and Mr Stevens, and I shall waste no time with him. One point only will I mention as an illustration of his miraculous powers of observation. He said that during a recent rain the volume of water was so great in the sewers of Panama that it "backed the sewage up into cellars and ruined many houses." There is not a cellar in Panama and never has been.

THE TESTIMONY OF AN AMERICAN BUSINESS MAN WHO HAS LIVED 16 YEARS IN PANAMA

A few days after this masterpiece of mendacity appeared in print I took up the Washington *Post,* a newspaper which is not open to the charge of extreme partisan support of the Canal Commission, and read therein the following interesting statement:

"Mr John N. Popham, a former Virginian, who has many friends in Washington, was seen yesterday at the Shoreham. For the past sixteen years Mr Popham has been engaged in railway building and mining manganese on the Isthmus of Panama and in Costa Rica. He was for five years special agent of the United States Treasury on the Isthmus, and no man is better qualified to speak of the conditions existing in that country. In conversation with a *Post* reporter Mr Popham said:

" 'Prior to last May the conditions on the Isthmus may have been open to just and intelligent criticism, caused by the delay in improving the physical condition of the Panama Railroad, purchase of necessary rolling stock, and improving the terminal facilities. But those conditions are forgotten history. The fair-minded residents of the Isthmus appreciate the magnificent efforts and splendid results accomplished since that time.'

"The statement made by Mr Poultney Bigelow is so far from being fair, the views so distorted, and the inference so frail, that it is only laughed at on the Isthmus, and it was so fully covered at home by that part of the President's communication to Congress the 8th instant, under the heading of 'Scandalmongers,' that there is but little left for a self-respecting American resident of the Isthmus to add. The people of Panama are intelligent, capable people. They appreciate the results accomplished; they have been and are anxious and willing to continue to help our people in the great enterprise that means so much to the whole world.

"After sixteen years' experience on and in the vicinity of the Isthmus, and knowing, as I do, the homes of the West India laborer in the great banana-producing districts near Colon, Bocas del Toro, and Port Limon, and having for many years employed from 400 to 700 Jamaicans daily at our mines, 35 miles from Colon, I feel competent to judge and to tell you that the West India laborer has never known, and in his most pleasant dreams has never hoped for, the splendid care and liberal treatment he is receiving from our government on the Isthmus of Panama.

"My knowledge of the affairs of the canal company only enables me to speak of conditions on the Isthmus and the work in progress there. But in every department of the canal work during the past seven months on the Isthmus the people of this country can rest assured that the investigation to be made by the Senate committee will confirm the following lines found in the President's communication to Congress: 'The work on the Isthmus is being admirably done, and great progress has been made.' "

That, gentlemen, is the testimony, vol-

untarily offered, of a man who can truthfully be called an expert. He has not merely made a twenty-eight hour visit to the Isthmus, but has lived there or in its vicinity for sixteen years. He is a man of unquestioned character, who has represented his government honorably there as its financial agent, and who has had practical experience in railway building and mining. The testimony of such a man should be final against the inventions and slanders not only of one, but of any number of scandal-mongers.

Speaking for the members of the Commission as well as for myself, I wish to say with all possible emphasis that we not only invite investigation of our acts but ask for it as a right. If we are doing our work honestly and efficiently, our hands should be upheld; if it is shown that we are doing it inefficiently, we should be removed; and if we are doing it dishonestly, we should be exposed, convicted, and sent to prison. Neither knaves nor incompetents should be permitted to have charge of a task of such magnitude. But while we court the fullest investigation, we earnestly ask that it be absolutely non-partisan, that it be made by persons of character and standing, either in public or private life, whose recognized intelligence and fair-mindedness are such as to command public confidence, and that it be made upon the ground.

We ask further that the investigation be made promptly and ended as soon as it can be and have its work done thoroughly. This is absolutely necessary if we are to maintain any degree of efficiency in the organization. The feeling of uncertainty and unrest which constant agitation about the Commission and its work creates is destructive of that interest in the work which is essential if the best results are to be secured. It is impossible to retain good men in the service under such conditions.

We protest in the name of American fair play against the dissemination in the United States of libels and slanders upon the efficiency and character of faithful workers on the Isthmus who, by reason of their absence from their own country, cannot defend themselves from such assaults. Many of them went to the Isthmus before it was made a healthful place in which to work, and in doing so faced death from disease as the soldier faces it from the bullet on the field of battle. They saw many of their comrades die from disease, but they themselves either escaped it entirely or recovered from its attack. A more loyal, faithful, efficient body of men than these servants of the United States on the Isthmus is not to be found anywhere on earth. Their devotion to the interests of their country entitles them to the gratitude of their fellow-citizens, and should protect them from the cowardly attacks of that most despicable of all assailants, the man who stabs in the back.

Gentlemen, I believe in the canal; believe that it can be built in a reasonable time, and believe that when, through American generosity and under American control, it shall be thrown open to the commerce of the world it will be hailed, and will prove to be, a priceless boon to all mankind. It will justify the faith of the American people in its wisdom and world-wide beneficence, and will justify also the expenditure of millions of American money for its construction. When it shall be opened for traffic the position of this nation in relation to the trade and commerce of the world will be a most favorable one.

THE PROFIT FROM THE CANAL

We shall have a virtually continuous coast line from the northeastern extremity of Maine to the western extremity of Alaska, open alike to the ships of the Atlantic and the Pacific, and giving to both the opportunity to trade directly with each other. San Francisco will be within 14 days of New York by steamers making 16 knots an hour, instead of 60

Fumigating Force, Panama

Opening of Panama Waterworks System July 4, 1905. In Front of Cathedral

days, and within 21 days of any English port, instead of 35.

The west coast of South America will be 3,000 miles nearer to our ports than to those of Europe, opening to our products an entirely new field of commerce which has in it great possibilities. These are the broad, general facts in the case, and I need not explain to you that they have in them opportunities which are of incalculable value. They open to the United States new markets for its products, new opportunities for that enlargement of foreign trade which our rapidly growing production is demanding year by year.

In this enlargement of industrial and commercial activity the whole nation will share. All railway lines, including the transcontinental, will be benefited by the increased traffic which will surely follow. New steamship lines will be opened to accommodate the new trade between the two Americas, and the expanded trade with Australia and the Orient. The world's traffic will be changed to new currents, and in the change all the nations of the earth will profit.

The population of the world one hundred years ago was estimated at 800,000,000; today it is estimated at 1,600,000,000. In other words, the growth of the world's population during the past century has been equal to its accumulated growth during the previous ten thousand years. If this ratio of increase shall be continuous, the new population of the globe will find its home, not in the densely populated districts of Europe, but in the sparsely settled countries of North and South America. The development of these countries and of their trade with the Orient, as well as with Europe, will all pay tribute to the Panama Canal, for it will be in the heart of this new growth and the pathway of its commerce.

But great and world-wide as will be the material benefits of the canal, the moral and political effects will be no less remarkable and no less salutary. In the United States the inevitable effect will be to develop a stronger and deeper sentiment of national unity than this country has ever known. New and larger trade relations will join the Atlantic seaboard and the Pacific coast more closely than even the transcontinental railways have accomplished, and will tend to unify in interest and sentiment all the Americas.

With the canal open, there will be no Atlantic and no Pacific fleet, either in the navy or in the merchant marine, but an American fleet. As an object lesson in the need of an isthmian waterway, the trip of the *Oregon* in the spring of 1898 from San Francisco to the coast of Florida was the most convincing argument ever adduced. With her powerful machinery working to its utmost limit and everything in her favor, including a commander of the first rank, 68 days were consumed in the voyage. With the canal open, she could have made the trip in ten or twelve days and without need of special haste. Instead of two navies, we shall have a double navy ready for all emergencies. The ability to assemble our warships quickly will act as a powerful influence in the direction of peace, for it will operate constantly as a preventive of war. The high position as a world power to which this nation, under the guidance of McKinley and Roosevelt and Hay, has advanced during the past few years will thus be strengthened and enlarged, and American influence upon the civilization of the world and upon the welfare of the human race will be immeasurably extended.

TRANSPORTATION METHODS IN ALASKA*

By Captain George S. Gibbs

Signal Corps, U. S. Army

IMAGINE, if you can, a country which has none of the hundreds of necessities of existence at hand and few of the thousands of accessories to industry—a country having a valuable output of products, almost all of which are useless to that country and are of value only when carried to far-distant lands.

Such is Alaska — dependent upon transportation for its very existence as a habitation and equally dependent upon transportation to give value to its ores and its furs. Two expressions, heard every day from Skaguay to Nome, tell just how the Alaskan pioneer feels about his position in this regard when he refers to Alaska as "on the inside" and the rest of the world as "on the outside." The implied barrier is significant, and it exists in fact, just as though the country were surrounded by a great wall, impassable for eight months in the year and none too easily scaled during the remaining short period.

Of course the ports of Juneau, Skaguay, and Valdes, and others on the southeastern coast, are open the year round, but neither freight nor passengers are carried to or from the interior of Alaska during the long winter season. A small amount of United States mail matter is carried in and out regularly by means of dog teams in relays, and each year a few adventurous and hardy travelers beat the season a few weeks by making the overland trip on foot and with dog team, either via Skaguay or Valdes.

So great is the transformation from an ice-bound, snow-covered, wind-swept wilderness to a land covered with luxurious vegetation and traversed by streams of navigable waters that the two seasons, summer and winter, suggest a convenient division of the methods of transportation.

Railroads, in the few places where short sections have been built, are in operation the year round, but with one exception they serve only local interests. Two short lines on the Seward Peninsula run from Nome and Solomon, on the

"Foxy"

One of the dogs belonging to the repair team at the U. S. Military Telegraph Station at Chena, on the Tanana River, Alaska

* The photographs were taken by the author.

1.

1. Horse Sleds delivering Supplies along the Trail between Valdes and Copper River during the Construction of the U. S. Military Telegraph Line

3. Soldiers of the U. S. Army dragging a Sled up an Incline through Soft Snow where it was Impossible for a Horse to Travel

coast of Bering Sea, to centers of mining camps a few miles inland. Another short line connects Chena and Fairbanks, on the Tanana River, with the placer claims fifteen miles away. Two projected lines, starting from Seward, on Resurrection

2. Horse Sleds Returning to a Cache of Telegraph Supplies for Another Load

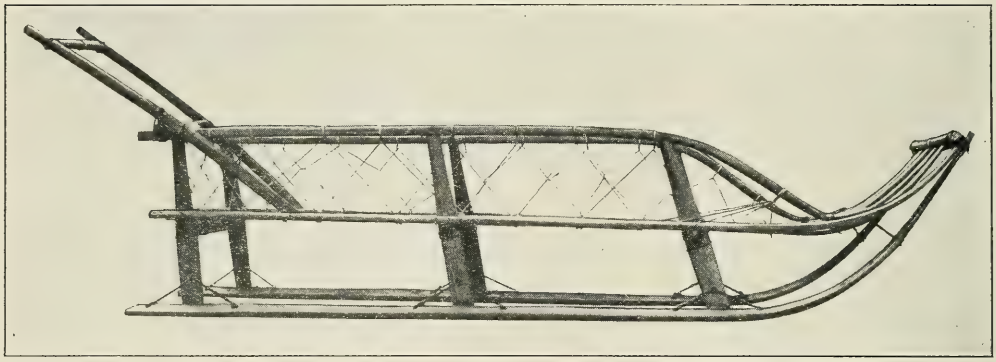
4. The U. S. Army Steamboat laid up for the Winter on a Sandbar in the Tozi River, Ten Miles below Fort Gibbon

Bay, and from Valdes, have the more ambitious object of connecting the Pacific coast with the Yukon; but the only railroad which is at this time a factor in reaching Alaska with supplies is the line, but little over 100 miles long, which

1. Signal Corps Repair Men from United States Telegraph Office, with Dog Team, out on Repair Trip. This picture shows well the dense growth that had to be cut along the Yukon and Tanana Rivers in order to build the telegraph line

2. Skaguay; Seaport Town of Southeastern Alaska. In the right of the picture will be seen the terminus of the White Pass and Yukon Railroad. In the upper left-hand corner is the "A. B." Mountain

1. Signal Corps Dog-team about to start from Fort Gibbon on a repair trip along the Telegraph Line. The sled, besides being loaded with wire and tools, carries a stove, tent, bedding, and food for men and dogs, making them independent for several days
2. A Typical Picture of an Alaskan Prospector with his Dog-team following up a Small Stream on a Stampede to New "Diggings." The man himself is hitched to the load and the use of the "gee-pole" is clearly shown
3. Indians Traveling by Dog-team on Yukon River. Note the squaw is running ahead breaking trail, while the man is riding on the sled
4. A Phenomenal Dog-team, composed of six mastiffs, hauling three-fourths of a cord of wood a load



Indian Basket Sled of Central Alaska, made of Spruce and Birch and Moose Sinew, with no Metal Whatever

connects Skaguay, on the coast, with the head of navigation of the Yukon at White Horse. As this latter point is in Canadian territory and about 600 miles from the Alaskan boundary, this line is largely useful, so far as Alaska is concerned, only during the few weeks when the river steamboats can receive the traffic and carry it to its destinations.

The use of wheeled vehicles in Alaska need scarcely be considered, as there are no roads connecting camps or towns, and wagons are used only on the streets of a few of the larger settlements, principally between dock and warehouse. The present Alaska Road Commission is doing effective work in laying out and constructing highways, but those highways for years yet to come must be mostly of the primitive kind, fit only for single-horse sleds and dog teams in winter and for pack animals in summer.

The means of transportation remaining, then, are:

In summer—

1. River steamboats.
2. Tugboats (between nearby coast points).
3. Pack animals.
4. Poleboats and canoes.
5. Flatboats and rafts.
6. Packs carried by white men and natives.

In winter—

1. Horse sleds.
2. Reindeer sleds.
3. Dog-team sleds.
4. Sleds drawn by men.
5. Packs carried by white men and natives.

All bases of supplies must be stocked for the entire year between June 15 and October 1. The hundreds and hundreds

Indian Birch Bark Canoe, used on the Rivers of Central Alaska, Containing a Fish Spear and Bow and Arrows

Traveling by Dog Team in Alaska

Observe the size of the load on the nearer sled. It probably weighs over 600 pounds and has been hauled 35 or 40 miles a day by 5 dogs

of tons required are carried to these bases in flat-bottomed, stern-paddle-wheeled steamboats, or in barges pushed by them—just such boats as still ply the waters of the Mississippi, the Ohio, and the Columbia. According to the depth of the rivers which they are intended to navigate, they are built to draw from 18 inches to 4½ feet of water and carry from 20 to 200 tons. Some few of these boats have been built in Seattle and steamed all the way to Alaska, convoyed by ocean steamers. Others have been built in sections at various places in the United States, even as far away as Philadelphia, and put together at Dutch Harbor or at St Michael. As a rule, they burn wood cut on the river banks, but recently some crude oil has been brought from California for fuel. At the close of the season these boats are hauled out on skides at some convenient place, or run into small streams, where they are protected from the terrible grinding force of the spring breakup.

During this same open period the mining camps must be supplied with necessities not laid in store during the winter freighting season, and the greater part of these stores is carried by pack animals.

The prospectors—the men who are breaking trails into the untrodden stretches of forest and mountain and sinking holes into the rich heart of a coming empire—must go their way alone and by means of their own activity and endurance carry each the three-quarters of a ton that is to keep them from starvation until another spring. A very few of these men use pack-horses, but the forage question is a serious one, and it is often next to impossible to take the horse to the place where packing is required. As far as water transportation can be utilized, it is many times easier and more efficient.

In going down-stream, flat-bottomed boats are used. These can be built of any required size, from any lumber available, and very often the boards for this purpose are whipsawed from trees right on the river bank. These unwieldy craft carry anywhere from a thousand pounds to ten tons or more, and are controlled, as they drift along with the current, by oars or by a single long "sweep" at each end.

A large portion of the prospector's journey into the hills usually follows up some stream which grows smaller and swifter each mile, until the water becomes too shallow to float a boat at all. For this purpose the poleboat is specially built. It is very narrow, with rounded bottom, and from 22 to 30 feet long, and carries from 1,200 to 1,800 pounds of provisions and equipment. This boat is propelled in either of two ways which circumstances at the time permit—a bridle is formed by attaching a divided line to two points on the boat, and a man follows along the bank with the tow-line. This is possible only when the path is free from trees and brush and steep inclines. In the operation of the other method a man stands erect in the end of the boat and pushes it forward by means of a long, light pole. Two experienced poleboat men can travel along at a surprisingly rapid rate against a swift current and with a considerable load. An inexperienced man attempting to handle a poleboat in swift water is apt to lose his outfit and his life as well.

The "Peterborough" canoe is very popular in Alaska for this same kind of work, but carries a much smaller load and is more expensive and harder to get.

Hastily constructed log rafts, while only resorted to when nothing else is obtainable, are so commonly used in Alaska that the list would not be complete without them.

The last stage of the prospector's journey, from the point where his boat becomes useless to the headwaters of the creek he is following, must be made on foot, and all indispensable supplies carried on his back. The balance of his outfit is placed in a raised cache and left until

Seals

Photos from U. S. Revenue Cutter Service

Feeding the Dogs

Reindeer Fawns

Photos from U. S. Revenue Cutter Service

Going Out on the Ice for Whales in April

the sledding season begins. In the regions where Indians are to be found, they can usually be hired to carry packs. They are able to carry from 50 to 100 pounds over long distances.

Here in "the States" the closing in of winter means the limiting of traveling facilities, and often renders quite impossible journeys by means of the cruder forms of transportation. Roads are blocked with deep snow, melting weather creates highways of bottomless mud, and many of the streams have too much ice to be crossed by boats and not enough to bear up animals and vehicles.

In Alaska, however, the "freeze-up" is the magic key which opens wide the trails to every valley and distant mountain fastness. It is Nature's unlimited franchise to the "sourdough" prospector, who, with a strong back and a weak mind, responds with tireless effort to the goadings of the gold fever within his veins. It extends equal privileges to the fur hunter, as he follows his long line of traps, and to the toiling freighter and the scheming tradesman, each of whom must have his surer and not always smaller share of the earth's rich treasure.

Broad streams and rushing torrents are bridged with ice strong enough to bear up a railroad train, and the mushy tundra, with its rough surface entirely made up of alternate water-holes and nigger-head hummocks, is leveled off with layer after layer of wind-driven snow.

Every stream becomes a highway. No part of the broad expanse is longer impassable, and the distribution can now begin from the stocks of supplies cached at convenient points by water transportation to the widely scattered places where those supplies are to be used.

The most efficient freighting unit for winter transportation is the single horse and sled. The sleds used are of various patterns, but the best one is built solid on a single pair of runners, cut under at each end, about 8 or 9 feet long, with a tread of about 28 inches, and with the bed 10 or 12 inches above the ground. The load is lashed on and, being low is not easily overturned. An ordinary load for such a sled is from 1,200 to 1,400 pounds, but on a good trail this amount may be increased to a ton. The great difficulties encountered in the use of horse-sled freighting outfits are that great labor is required in choosing and breaking a trail, the horse is easily injured by extreme cold and must have careful attention, and the amount of forage required for the distance traveled is enormous. These disadvantages are compensated for only by the large size of the load hauled. In point of speed, especially over unbroken trails through deep snow, the horse is not in the same class with the dog team.

The introduction of domestic reindeer into Alaska has given that country a new and useful animal which is already becoming a source of comfort and employment for the native Indians, whose condition in every way is deplorable. By them these animals will have some usefulness as beasts of burden, but for anyone to maintain that they are, or will become, an important adjunct to the transportation facilities of the country, is misleading. They have been tried for various kinds of work during a period of several years, and have been unreliable and inefficient in comparison with horses or dogs. If driven through a country where moss can be found for them to feed upon, they can at least carry their own bodies, and in that way become a source of meat supply that may, as has been demonstrated in some notable instances, perform an invaluable service in the saving of human life.

Peculiarly fitted for Arctic travel, reliable and faithful in his work, and devotedly attached to the hand that feeds him and the voice which commands him by entreaties or by curses, the dog plays a part in Alaskan life that is indispensable and for which there is no substitute.

Alaska is not behind the times in up-to-date methods and appliances. Her camps are lighted by electricity and her mines are worked by means of machinery of the latest approved type, yet the United States mail is carried from one end to the other by dog teams.

While men in the freighting business use horses and mules largely, the individual miners and others do not attempt to maintain these animals, but have dog teams with which they do all of the small hauling for their establishments. Wood for fuel is delivered from the mountain side to the cabin door; frequent trips are made to the nearest trading store for provisions, for the mail, and for the society of fellowmen, and excursions to distant camps and prospecting trips into the hills are made almost exclusively by dog team.

The United States military telegraph system, operated by the Signal Corps of the Army, maintains a dog team at each of the stations along its 1,400 miles of land lines. These teams are used by the repairmen in going out on the line to repair breaks. They carry, besides tools and materials, a small tent, stove, bedding, and food for men and dogs, so that they can take care of themselves if kept out for several days.

A few years ago different breeds of dogs were used in different sections, but increased travel has brought into service all of the dogs to be had in the country and hundreds in addition that have been brought from the outside. The native malamutes, huskies, and dogs from the Mackenzie and Peel rivers are more hardy and last longer in service than the outside dogs. Newfoundlands, Saint Bernards, setters, and shepherd dogs are superior in intelligence, but they are lacking in endurance, require more careful feeding, and their feet are easily frostbitten, which renders them useless for the time being.

In the region of Norton Sound it is the custom to hitch dogs in pairs with a leader in front, a team usually consisting of seven or nine dogs. The Indian pattern harness is used, and the sled is of the basket type, about 10 feet long, with a track 20 inches wide, and capable of carrying from 400 to 600 pounds. This method of hitching is practicable only where the trail is wide, as along the shore ice.

In the interior the Indians use basket sleds, but with a track about four inches narrower and of lighter construction, and they hitch the dogs in similar harness, but string them along a line with considerable interval between dogs. From 300 to 400 pounds is the capacity of this sled, and the team usually consists of from 4 to 6 dogs. The native sled is made of spruce, with green birch runners, but the white man has built for his own uses a sled of similar pattern, made of hickory and oak and shod with steel. He also uses harness made in the factories outside, consisting of a collar stuffed with hair and traces which snap into rings on the collar of the dog next in rear.

The pioneers from the northwestern states brought with them to Alaska a type of sled which is now known as the "Yukon sled," a name probably given to it by dealers in San Francisco and Seattle. It is used for general knock-about purposes, being very strong and with the bed less than 6 inches from the ground, but short and of small capacity. This sled is a miniature of the one described as being the best type of horse sled.

Dogs are fed but once a day—in the evening, after the day's work is finished—because they are unable to work after eating. They thrive best upon a feeding of 7 or 8 pounds of corn-meal mush per dog, into which has been cooked a pound of sun-dried salmon (without salt). Of course they will get along on a sufficient quantity of almost anything that can be eaten, and many long journeys have been accomplished on absolutely nothing but dried fish and snow. A day's travel with

Hauling Supplies to Whale Ships on the Arctic Coast of Alaska

a dog team, under ordinary conditions of load and trail, is from 35 to 45 miles.

The driver does not often ride on the sled. He is usually anxious to haul as large a load as possible. His entire attention and strength are likely to be needed to keep the sled on the trail, and, besides, in very cold weather continuous running is necessary to keep from freezing.

Alaska is subject to frequent manifestations of that hysterical and frequently fatal malady—the gold fever. A rumor is started that "Long Bill" has uncovered a rich find on some creek on the upper Koyukuk, or that "Windy Jim" and his partner have sneaked into camp with pokes full of dust from some mysterious creek equally far away. There is at once an exodus in the direction of the new Eldorado. The price of a dog goes up from $40 to $100 or $150. Every kind of canine that can pull a pound, from Great Dane to fox-terrier, is impressed.

At such times men start out without other assistance than the stimulus of their chimerical visions. What food, clothing, and bedding they take must be packed on the back or drawn on a light hand-sled.

Some men have traveled all the way from Fort Yukon to Coldfoot, and others from Circle City to the Tanana, on foot and alone, with packs of 60 pounds on their backs.

Here in our home country, where every one is now and then whirled along in a luxurious modern railroad train, and, arriving at his destination, is besieged by hacks and cabs and baggage wagons of infinite variety and number, with street cars passing by and broad, level streets stretching out before him, it is quite impossible to realize the conditions under which transportation is accomplished in far-off Alaska.

Private enterprise is doing much to improve the facilities, and the government is permitting the people of Alaska to spend their own tax money on the improvement of roads and trails; and Congress would be doing little enough if it would give liberal assistance to the railroads that are struggling for a start in that trackless country.

WINNING THE WEST*

AN ACCOUNT OF THE MARVELOUS PROGRESS OF OUR RECLAMATION SERVICE IN RECLAIMING THE DESERT

By C. J. Blanchard

Engineer, U. S. Reclamation Service

AMERICAN irrigation was old when Rome was in the glory of its youth. The ancient aqueducts and subterranean canals of South America, extending for thousands of miles, once supplied great cities and irrigated immense areas. Centuries before the venturous Norseman landed upon the bleak and inhospitable shores of New England, a large population dwelt in the hot valleys of our far Southwest. From the solid rock, with primitive tools of stone, they cut ditches and hewed the blocks for many chambered palaces, which they erected in the desert or on the limestone ledges of deep river canyons.

These voiceless ruins, older than the memory of many centuries, tell the story of a thrifty, home-loving and semi-cul-

*An address to the National Geographic Society, January 12, 1906, with photographs from the U. S. Reclamation Service.

tured people, concerning whose fate history brings us no word. In these palaces and in many miles of canals we may almost read the story of another Egypt—a people toiling under the burning sun of the desert, wearily and painfully executing the commands of an American Pharoah.

Coming down to a period less remote and only slightly less interesting, we mark the first page of our own written history. Here in the sixteenth century Coronado, the first great American explorer, swept up the Rio Grande Valley and journeyed as far north as Kansas. In New Mexico he found a pastoral race dwelling in pueblos and practicing the gentle art of irrigation as had their forefathers, perhaps as far back as in the days of Abraham. Certainly their agricultural methods were in no wise different from those which prevailed in the days of the prophets. Even unto this day their grain is gathered in great willow baskets, is threshed by the trampling of sheep and goats and winnowed by the winds. Fields which were cultivated three centuries ago are still producing crops each year.

Some of these thoughts came to the government engineers as they ran their lines of levels in the valley of Salt River in Arizona, and it seemed to them a proper task for the greatest nation on earth to restore once more the oases of verdure which the desert had long ago obliterated.

AN AREA EQUAL TO MASSACHUSETTS HAS BEEN WRESTED FROM THE DESERT

During the last quarter of a century a crop-producing area of 10,000,000 acres, or another state of Massachusetts, has been wrested from the desert. Irrigation canals long enough to span the earth twice and representing an outlay of $90,000,000 have been built. Every year this area returns a harvest valued at more than $150,000,000, and 2,000,000 people dwell in prosperity and content where only a short time ago the wilderness reigned.

Uncle Sam is today the largest owner of the Great American Desert, no doubt because it was not considered worth stealing. For many years the sentiment has been growing that the government should make habitable this vast empire which is so great potentially. This sentiment crystallized into a law on June 17, 1902, when President Roosevelt affixed his signature to the national irrigation act. The principal features of this law are briefly:

THE PROVISIONS OF THE RECLAMATION LAW

First. A reclamation fund in the Treasury, consisting of the proceeds from the sales of public lands in the 16 arid and semi-arid states and territories.

Second. A Reclamation Service in the U. S. Geological Survey to investigate and report on the irrigation projects for the approval of the Secretary of the Interior, who may authorize construction and let contracts, providing the money is available in the fund.

Third. The return to the fund of the actual cost of each project by the sale of water rights, payments to be made in a series of installments running over a period of ten years.

Fourth. The holding of public lands for actual settlers under the homestead act, in small farm units sufficient to support a family; no commutation to be permitted.

Fifth. The sale of water rights to private land owners, but not for more than 160 acres, making land monopoly impossible and forcing the division of large estates.

Sixth. The ulitmate turning over to the people of the irrigation works, except the reservoirs, to be operated and managed by them under a system of home rule. The actual users of the water in ten years after the completion of the works will have repaid to the government the amount of its loan without interest. The money so returned may again and again be expended on other works.

At Work on one of the Ditches of the Truckee-Carson Project in Nevada

One of the Canals of the Truckee-Carson Project, Nevada

Opening one Branch of the Truckee-Carson System, June 17, 1905

"The Canals Tunnel through Hills"

The Reclamation Service in the comparatively brief period of its existence, and notwithstanding the enormous extent of the country, embraced in the arid regions—two-fifths of the United States—has completed the surveys and perfected estimates for twenty-four irrigation projects, all of which have been approved by the Secretary. Upon twelve of these actual construction has begun, and on one (the Truckee-Carson) a large and important unit was completed and formally opened on the third anniversary of the reclamation act.

THE TRUCKEE-CARSON WORKS IN NEVADA

The first of the great works undertaken by the government is in Nevada. In the bed of ancient Lake Lahontan and embracing what was long known as Forty-Mile Desert, the most desolate and arid spot on this continent except Death Valley, the engineers completed the plans for an extensive irrigation work involving some rather novel engineering features. The principal engineering features of this project are lifting the waters of the Truckee River into the great canal which will carry them over into the Carson River reservoir, whence they are diverted into laterals and carried out upon the desert. In their entirety the plans involve extensive storage works on Lake Tahoe and the complete utilization of the four rivers which now flow out into Carson sink and are evaporated. The works so far completed are of the most permanent character. The great

dams on the Truckee and Carson rivers, the former 110 feet in height, are beautiful and finished products of modern engineering. There has been no disposition to save on cost at the expense of this work. The government must maintain these structures for ten years, and it is building them so that when it turns them over to the people they will get their money's worth.

The long lines of canals, many of them large enough to carry rivers, are lined in places with cement, and obstacles in the route, such as hills, are tunneled and the tunnels are cement-lined. When complete this project will cost more than $9,000,000 and will render productive more than 400,000 acres of land now absolutely worthless, but which, irrigated, will readily sell for $30,000,000.

Government Sawmill in Arizona, built by the U. S. Reclamation Service. Millions of feet of lumber have been cut for the Government work

THE SALT RIVER PROJECT IN ARIZONA

In the land of mystery, of lost races and hoary ruins, in the warm and sunny valley of Salt River, we find one of the greatest engineering works in the world now well under way. Many miles above the valley, in what was once an almost inaccessible region, peopled only by the murderous Apache and the old-time outlaw, the Salt River and its tributary, Tonto Creek, emerge from the canyon

and flow across a broad, level flat. Here 2,000 men are at work erecting the Roosevelt dam, which is to be one of the highest in the world, exceeded in height by only one other, and that also a structure of the Reclamation Service. The Roosevelt dam will be of uncoursed rubble masonry (sandstone and cement) with arch upstream. It will be 800 feet long on top, 235 feet at river bed, and its contents will be 300,000 cubic yards. It will rise 284 feet above the lowest foundations, and the height of water against the dam will be 230 feet. A power canal 18 miles long with a drop of 220 feet is now being utilized to furnish 4,000 horsepower in constructing the works.

THE GOVERNMENT IS MAKING ITS OWN CEMENT

When the reservoir is completed the water will flow in the river channel for 44 miles, and then be diverted by means of canals to the irrigable lands. In the construction of the dam 240,000 barrels of cement are required. The question of cement was not the least of the problems which troubled the minds of the engineers. The isolation of the dam site—60 miles from a railroad—and a tendency on the part of cement manufacturers to put as high a value on their product as they thought it would bear, offered a problem which nearly stumped the engineers. The first bids were $9 a barrel, making the item of cement a matter of more than $2,000,000 alone. Then it was that the engineer with the geological bump got busy. A hasty reconnaissance of the nearby country disclosed the fact that a ledge of splendid limestone outcropped just above the dam site, while hills of blue clay were within a short distance. Notwithstanding the vigorous protests of the cement manufacturers and their offer of cement at about half the price of former figures, the Secretary of the Interior authorized the building of a cement mill. This mill has been in successful operation for several months and is turning out 250 barrels of first-class cement every day, at a cost which will save the settlers of the Salt River Valley more than a million dollars on the price first offered by the trust.

THE MOST CAPACIOUS RESERVOIR IN THE WORLD

The question of supplies was an important one, and to meet the conditions a wagon road was constructed, to the cost of which the municipalities of Phœnix, Mesa, and Tempe contributed $75,000. This road was constructed by the government engineers, and not by contract, and is one of the most spectacular pieces of engineering in the west. For more than 40 miles it is in the canyon of the Salt River, many miles having been blasted from the precipitous walls. The day laborers were mostly Apache Indians, remnants of Geronimo's band. The road opens up a new region of beautiful scenery, and when the great dam is completed the Tonto reservoir and the Roosevelt dam will attract the transcontinental visitor. The reservoir created by the dam will be one of the largest artificial lakes in the world. Its capacity will be ten times greater than the Croton reservoir. It will contain more water than is stored by the Assouan dam. One million four-hundred thousand acre-feet, or enough water to cover that many acres a foot deep, will be held in this basin until needed by the farmers in the valley below. At the present time in the lowest part of the reservoir site is a thriving city called Roosevelt, with a population of nearly 2,000; a city with electric lights, water works, school-houses, stores, and churches, which will be submerged more than 200 feet when the dam is completed. Ten thousand horse-power will be developed from the dam and from drops in the canals, all of which will be utilized to pump the underground water of the valley to lands above the gravity systems.

WHERE COURAGE WAS EVEN MORE NECESSARY THAN ENGINEERING SKILL

Coming northward into western Colorado we find the engineers of the Recla-

mation Service constructing one of the most spectacular works ever attempted in the West, a great tunnel nearly six miles in length and passing under a mountain 2,000 feet high. The history of this project is one of danger, daring, and heroism. Flowing in deep canyons in places more than half a mile below the surface of the country, over precipices, through narrow gorges, the Gunnison Canyon had never been explored until Mr A. L. Fellows of the Reclamation Service and one companion essayed the feat.

They fastened their instruments and provisions on an inflated rubber mattress and set forth upon what proved to be a most thrilling and exciting adventure. Over a greater portion of the trip they were so far below the party which followed them along the brink of the canyon that no voices could reach them. At other points they were lost from sight, during which time the anxious watchers were fearful of their safety. After several days they finally emerged by way of the Devil's Slide, having in the last hours of the trip suffered a loss of their boat, their instruments, and provisions, and narrowly escaped death.

Fortunately Mr Fellows had his notes in oil skins secured to his person. From these notes it was possible to select a site in the canyon for a tunnel through which the waters of the Gunnison River will be carried to supplement the insufficient flow of the Uncompahgre River, and thereby make fertile 130,000 acres of land in the valley of the latter stream. The Reclamation Service is doing this work under force account, owing to the failure of the contractors to comply with the regulations. More than 6,700 feet of this great underground waterway are now completed and the work is being pushed forward vigorously night and day. It will be completed in 1908. The tunnel and canal system will cost about $3,000,000.

THE PATHFINDER DAM IN WYOMING

Proceeding to the northward, we find progress is being made in the construction of another great dam, the Pathfinder, which is located upon the exact spot where General John C. Fremont nearly lost his life while attempting to pass through the Platte River Canyon in a boat. This dam will have a height of 210 feet and will create a reservoir storing more than a million acre-feet. It will prevent for all time to come the disastrous floods on the North Platte, which annually destroy property valued at many times the cost of this structure. In connection with this dam there is being constructed an interstate canal 140 miles long and covering 200,000 acres in eastern Wyoming and western Nebraska. Its route is along the old overland trail.

THE HIGHEST MASONRY ARCH IN THE WORLD

In northern Wyoming, near the spot that Mr Seton-Thompson has made famous as the resting place of Wahb, the grizzly, work is now under way on the Shoshone dam, a concrete masonry arch and the highest structure of its kind in the world. It will lock a very narrow granite canyon, so that in cubical contents it will not compare with any one of several other dams, but in its great height it tops them all. From bed rock to top it will be 310 feet high. At its base it is only 85 feet long, and on top only 200 feet. The bed-rock conditions at this site proved a great surprise to the engineers. On first investigation it was thought that the river flowed on a granite foundation, but when the diamond drills were brought in they went down 88 feet in places before finding a permanent base. Boulders 38 feet in thickness were penetrated resting on beds of sand and gravel. The site of the dam is in an almost inaccessible region, and, as in Arizona, it was necessary to construct a road up the canyon for several miles. This is destined to be one of the new routes to Yellowstone Park, and it will become popular by reason of the scenic beauties which it opens up. The Shoshone project, with

its great dam, its hundreds of miles of canals and ditches, will cost about $2,250,000 and will irrigate 100,000 acres of land.

At the foot of the Black Hills, in South Dakota, in the valley of the Belle Fourche River, another great work is going forward rapidly. This project involves the construction of the highest earthen embankment in the world, over 115 feet high, more than one mile in length, and 20 feet wide on top. This great dike will create a lake about 20 miles long by 5 miles wide and in many places more than one hundred feet deep. The entire flow of the Belle Fourche River will pass into this artificial lake, and will then be diverted in canals to water about 85,000 acres of very choice land, a large percentage of which belongs to the government. The cost of the project will be $2,700,000, and it will be completed early in 1907.

A REMARKABLE TRANSFORMATION

In southern Idaho the Minidoka project, located on the Snake River, embraces about 100,000 acres of sage-brush land. Work is well along on this project, which involves a rock-fill dam across the Snake and many miles of canals. The dam is now within 30 feet of closing the river, and canal lines extend all over the tract. A remarkable transformation has taken place in this section since the com-

A Cabbage Farm, near Phœnix, Arizona. Five crops are raised each year

ing of the engineers. A year ago last spring I drove across this tract of land with the supervising engineer, and we camped for the night on the banks of the river at a point which we marked out as the site for the future metropolis of the valley. In fact we drew a rough plan of the town, which was afterward enlarged and then approved by the department.

That night, save for our own campfire there was no other evidence of human habitation within 30 miles of us; only a vast expanse of sage brush extending to the horizon on every side. Last October, in a passenger coach, I went over the same route, traveling on a new line of railroad. I passed three new towns having a total of more than 120 business houses, including three newspapers, one private and two state banks. Every 80 acres under that project has a dwelling upon it, and where a little over a year ago the desert was in full control, there now dwell nearly 4,000 people. All of this development has taken place before the water has actaully been supplied to a single acre. Next spring Uncle Sam will hold a public sale on this project, when he will put on the market the lots embraced in the three town sites which have been laid out thereon.

An effort is being made to secure the consent of Congress to permit the money received from the sale of these town lots to be loaned to these towns for the construction of water works and sewerage systems, the money to be repaid in accordance with the provisions of the reclamation act and the work to be done by the government.

THE VALLEY OF SNAKE RIVER IN WYOMING

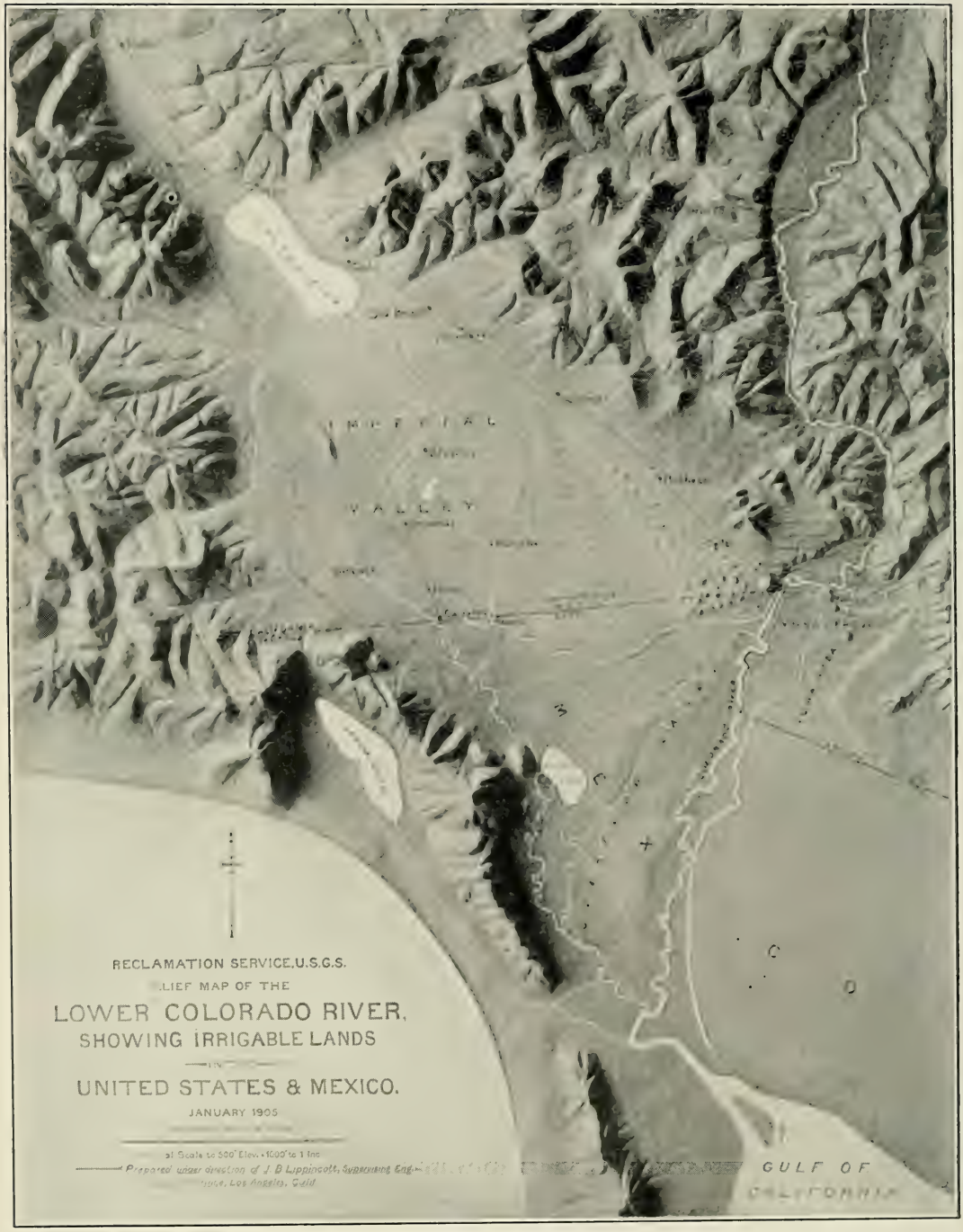
A tremendous development has taken place in the last few years in the great valley of Snake River, and approximately 1,000,000 acres have been reclaimed from the desert. All of the normal flow of this stream above Glenn's Ferry is now utilized and the further extension of irrigation works makes the question of flood storage an exceedingly important one. This question has not been overlooked, and the government has reserved numerous lakes at the headwaters of the Snake in Wyoming, and in the near future will begin the construction of storage works. Water rights are being adjudicated and a plan is being formulated whereby all of the canal systems, by contributing to the cost of these works, may have their water supply increased.

THE AMERICAN NILE

It is a far cry from Idaho to Egypt, but not so far after all if we remember that there is an American Egypt and an American Nile. Rising in the snow-capped mountains of western Colorado and Wyoming, the Colorado, America's Nile, drains an area of 230,000 square miles and pours a turbid flood into the Gulf of California. In its lower valley, the climate, soil, and products are singularly like those of the great valley of Egypt. Here the date palm grows in all its tropical luxuriance, and the Department of Agriculture is only waiting the advent of canal-borne water to introduce more than 200 varieties of this fruit. Here the orange and pomelo produce abundantly. It is a spot where Nature smiles the whole year upon the labors of the husbandman, and it is so hot that dwellers there are said not to worry about their future home.

Across the great Colorado River, about 12 miles above Yuma, the government is throwing a dam the like of which this country has never seen before. It is of the East India weir type, a great mass of masonry resting upon sand. This style of dam was made necessary for the reason that no bed rock was found at this site, nor was any found at any other point on the Colorado where it would have been feasible to construct a dam for irrigating the lower valley. The Laguna dam will have an extreme length across channel of 4,780 feet. Its height will be only

The Site of the Pathfinder Dam, on the North Platte River, Wyoming


IMPERIAL
VALLEY
RECLAMATION SERVICE, U.S.G.S.
RELIEF MAP OF THE
LOWER COLORADO RIVER,
SHOWING IRRIGABLE LANDS
IN
UNITED STATES & MEXICO.
JANUARY 1905
GULF OF

19 feet, but its length up and down stream will be 346 feet. Its weight will be approximately 600,000 tons, and its cost will be $797,650. The diversion headworks will be on both sides of the river, connecting with two canal systems, which will supply lands in California and Arizona. The headgates are so arranged as to draw off only the top foot of water, thus avoiding most of the silt. The silt deposited will be sluiced out by opening gates which discharge back into the river. The problem of silt which confronted the engineers here can be better understood when it is known that during a flood the Colorado River in 24 hours carries past the dam site 1,500,000 tons of silt.*

Many miles of levees on both sides of the Colorado and Gila rivers will be built to provide against the annual inundation of the bottom lands. These levees will be of the same type as on the lower Mississippi. The canal crossing the Gila River will pass several feet below the river bed and will be in a siphon of steel and concrete about 3,300 feet long.

Especial interest attaches to this work by reason of the very unusual conditions which now exist in this region. In former times the Gulf of California extended as far north as Indio. The Colorado deposited its great burden of silt and detritus into this arm of the sea and finally built up a bar clear across it, shutting off a portion of the gulf. Under the burning sun of the desert this inland sea gradually evaporated. From time to time the river overflowed this dike and spilled some of its floods into the lake, carrying the salts to the deepest part of the depression, which became heavily impregnated, and leaving on the higher grounds a portion of its rich sediment brought from its mountain drainage. The Colorado River flows through its delta on top of a dike which it has built up, so that its channel is at a higher elevation than the country through which it passes.

LOSING CONTROL OF THE RIVER

In 1900 men came and viewed the sunken desert and, realizing its possibilities if watered, began the construction of a canal which headed in the river a short distance above the international border. Complications arising in regard to this diversion, the heading was moved farther down stream into Mexico. The canal for some distance was just below the international boundary and then followed an old river channel, turning northward into California into what is now called Imperial Valley. Irrigation wrought its usual miracle. Hundreds of settlers flocked into the valley and took up homes. Railroads were built, towns grew up, and last summer more than 80,000 acres were under cultivation and 8,000 people were living below the level of the sea. There were no permanent headworks in the canal, and a great flood came which could not be controlled. The canal, having a heavier grade than the river channel, gradually took an increasing share of the water, until at this time the Colorado is pouring its floods as well as its normal flow into the Salton Sea, now a great body of water 60 miles in length and many miles wide. The railroad has been submerged and the company forced to build on higher grounds. The salt works, which had become a prominent industry, have been destroyed and there is danger, if the river cannot be returned to its proper channel, that the rising sea will submerge all of the valley which is below sea-level. Several of the best engineers of the country are in consultation, and it is hoped that the problem of returning the Colorado to its proper channel will be solved.

THE KLAMATH BASIN

In northern California, in the "Land of Burnt out Fires," and extending over the line into Oregon, work has just begun upon what is classed as one of the most unique of all of the projects undertaken

by the Service. It is known as the Klamath project, and involves features of irrigation, storage, and drainage in unusual combination. The Klamath Basin includes about 400,000 acres of land, of which 250,000 are irrigable from this project. Some of the topographic features are singularly interesting. Elevated the valley. Lost River, which rises in Clear Lake, winds its tortuous way for 60 miles, finally emptying into Tule Lake, of which it is the only source of supply. Tule Lake is only six miles from the source of Lost River. By constructing a dam in the river at Olene, it is proposed to cut off the river from the lake and

Indians (Apaches), survivors of Geronimo's Band, building a Road to the Roosevelt Dam, Arizona. (See page 89)

some 50 feet above the valley is the upper Klamath Lake, the outlet of which is Link River, which flows through Lake Euwane at Klamath Falls into Klamath River. Upper Klamath Lake is the principal source of supply for the lower part of the project. By means of a deep cut the waters of this lake are drawn into a large canal and carried southward into utilize the water at various points in its valley. Tule Lake will dry up. The lake bed will then be irrigated from the main canals supplied from Klamath Lake. Lower Klamath Lake is considerably higher than Klamath River, its level being maintained by a natural dike or ledge of basalt which crosses the river at Keno. By excavating a channel seven feet deep

through this dike, it will be possible to drain nearly the whole of Lower Klamath Lake, exposing many thousands of acres of rich tule lands, which will also be brought under irrigation from the main canals. While exceedingly unique, all of the engineering features are comparatively simple and the average cost per acre is the lowest of any of the projects so far approved. The climate of this section is temperate, the soil is fertile, the products include alfalfa, all of the cereals of the temperate zone, vegetables, deciduous fruits, etc. The Klamath basin is situated about equally distant from San Francisco and Portland.

Moving Camp, U. S. Reclamation Service

In the pleasant valleys of the Payette and Boise rivers in Idaho, a region favored with an equable climate and fertile soil and a most progressive people, one of the largest of these irrigation projects has just been approved. Bids are now being advertised for the first units of this project, involving the expenditure of $1,300,000. In its entirety the project provides for the reclamation of 372,000 acres of land, mostly in Boise Valley, an area equal to twice the cultivated acreage of Rhode Island. The canal systems now in operation and irrigating about 100,000 acres are to be made a part of the project and utilized as feeders or laterals. Great dams in both the Payette and Boise rivers will hold back the floods, and by a long canal, a portion of which passes through a deep

cut, the waters of the Payette drainage will be brought over into a reservoir in the Boise Valley to supplement the insufficient supply of the Boise River. It will require a number of years to complete this work and the expenditure of about $9,000,000. At the present time this section has a population of about 15,000. When the works are finished it will easily support as dense a population as the Salt Lake Valley, or 120,000. Nearly $40,000,000 will be added to the value of taxable property in land values alone.

Three projects have been approved in the state of Washington. The Okanogan, in the northern part, to cover about 10,000 acres, will cost about $500,000.

Two projects in Yakima Valley, the Sunnyside and the Tieton, aggregating 64,000 acres of land, at an approximate cost of $1,750,000. The Yakima Valley contains an irrigable area of approximately 500,000 acres, and with the storage in the lakes at the headwaters it is estimated that the water supply will be sufficient for 340,000 acres. In addition to this, there are 100,000 acres in the Yakima Indian reservation which may be brought under canals at a moderate cost, but for which there is no late summer flow in the river. The development of a comprehensive system of irrigation in this valley is to be accomplished by the successive construction of several units of a greater project, the work being gradually extended to embrace the entire irrigable area. Not less than $12,000,000 will be required. The present plans provide for the purchase of the Sunnyside Canal, the most important irrigation system in the valley, and its enlargement and extension to cover new areas.

A SUMMARY OF WORK DONE AND ESTIMATES FOR THE FUTURE

A summation of the work of the Reclamation Service for the three years in which it has been organized shows that it has built 77 miles of main canals, some of them having the size of rivers; 54 miles of distributing canals, and 186 miles of ditches. It has constructed and has in operation 150 miles of telephone, 125 miles of roads in canyons involving deep cuts. It has excavated 10,000,000 cubic yards of material and 3½ miles of tunnels. Work is now actually going on in 13 different projects.

The reclamation fund at this time available for investment by the Secretary of the Interior in feasible irrigation projects is more than $28,000,000. The estimated increment to the fund from the sales of public lands in 1906, 1907, and 1908 is $9,000,000, bringing the total fund up to $37,000,000. Nearly all of this has been apportioned by the Secretary for the construction of the 24 projects mentioned and for which plans have materialized. This practically brings to an end further surveys and examinations and provides for the concentration of efforts of the Service on the actual construction of the works.

Conservative engineers estimate that the reclaimable area of the Great American Desert is 50,000,000 acres. Assuming the average cost per acre of irrigation to be $30, the reclamation of this area will involve the expenditure of $1,500,000,000, or seven times the cost of the Panama Canal.

Some of the reclaimed land has a value of more than $1,000 per acre. The average value of irrigated land in the United States, according to the last census, is $47 per acre; so that the reclamation of this vast empire in the West will result in an increase in the taxable property of the people of $2,350,000,000. It will provide homes for 600,000 families on farms.

And out of the desert, now only the haunt of the skulking coyote and the jack-rabbit, fair cities shall rise, and in the midst of islands of emerald the smoke of thousands of industries shall ascend. Every intermontane valley shall boast of its Riverside or its Redlands, communities representative of the highest and fairest type of the homes of home- and honor-loving Americans.

Before the engineers could begin work on the Shoshone Dam in Idaho they had to construct a road up the canyon and several times tunnel through granite mountains, as in the above picture. (See page 90)

In Arizona

ARIZONA AND NEW MEXICO

Extracts from a Speech of Hon. B. S. Rodey, Formerly Delegate of New Mexico, in the House of Representatives

IT is said that there are great arid wastes in New Mexico and Arizona. Now, that is true to some extent; but there is not anything so hard to get rid of on the face of this earth as a popular misconception, and there is not a more deep-rooted misconception extant in this nation than the conception that is in the minds of the people of this Congress with reference to Arizona and New Mexico.

There is not a square mile of the surface area of either of those great territories that has not its use for something, either for pasture, for lumber, for coal, for minerals, or for agriculture. The area of New Mexico alone is bigger than the area of the state of New York, all the New England states, and New Jersey combined. We can give up the size of a few ordinary states to the desert and still have a good many others left for the purpose of agriculture.

Most people think we have no resources in those territories. There are not a dozen men within the sound of my voice who know that Arizona has the greatest forest within this nation. The greatest forest of white-pine timber which the continental United States affords exists in Arizona; it runs from its northwest corner down to its southeastern corner. The second greatest forest in this nation is in New Mexico. The greatest coal field in this nation is in New Mexico. The greatest iron depôsit in this nation is in New Mexico. Our territory has iron enough to gridiron China with steel rails and coal enough to smelt it; and yet we are told by gentlemen that we can never support a great population, and that unless we have vast agricultural resources we can never have people. The city of New York alone has more people than each of three-fourths of the states of this Union and it does not produce a potato. The state of Pennsylvania does not raise enough farm products to support its 6,000,000 splendid people.

Is there nothing but agriculture that will support a population? I deny but what we have sufficient agriculture for that purpose, and we will have a great deal more when our waters are impounded, as they will be under the beneficent reclamation act, which was the greatest law in my estimation since the homestead act itself; and when, under the provisions of that act, New Mexico and Arizona shall have their available waters impounded—the flood waters—that now go down, unused, to the sea, they will have an area of cultivation amounting to at least 20,000,000 acres, and that will be equal to 80,000,000, or a tract almost as big as New Mexico itself, because when once irrigated, one acre of our lands is equal to four of any other land in non-irrigated sections.

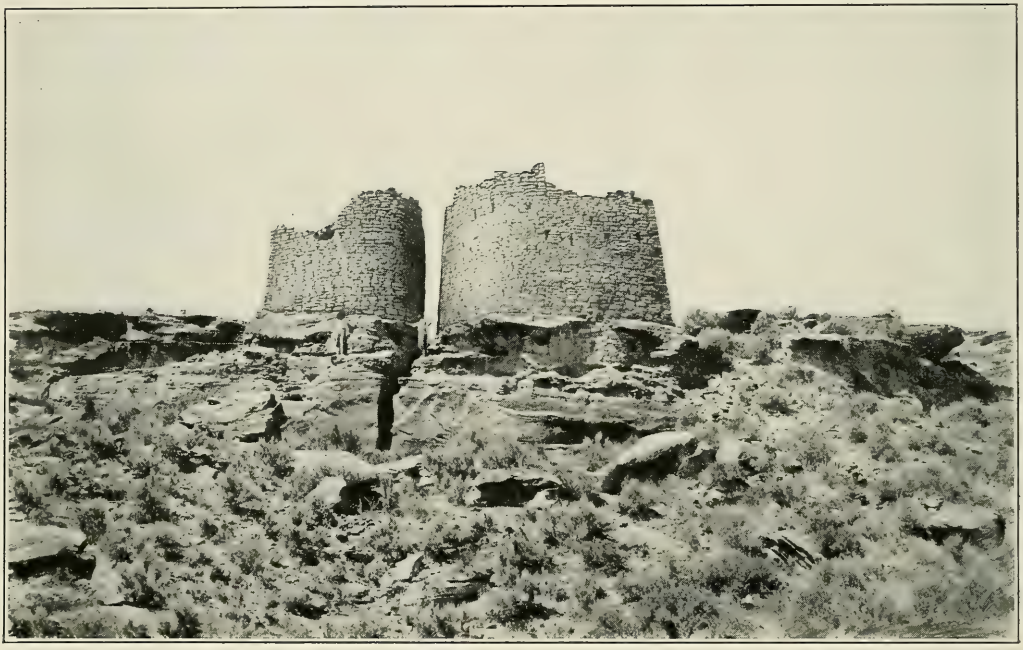
Do you think that with all these resources we will not support a population? Look at the city of Denver. Twenty-five years ago gentlemen who are now objecting to us would have said that no such city as that could ever come into being in a place like that. It has no more agricultural resources, as the gentleman from Colorado will confess, than we have, and yet there is there today a city of 150,000 or 200,000 people.

New Mexico grazing lands now support seven millions of sheep, a million and a half of cattle, hundreds of thousands of horses, and a vast number of Angora goats. She shipped last year 200,000 head of cattle, 30,000,000 pounds of wool, a vast number of sheep and lambs, and a million and a half tons of

bituminous coal. She shipped since the census was taken $5,000,000 worth of dressed lumber, some of it even as far east as New York city. Since the census was taken in New Mexico we have built 1,200 miles of railroad and equipped it, and it is in operation, a distance equal to that between New York and Omaha. We added 170 new post-offices to our list since the census was taken, and yet you think we are not progressing and that we are stagnant and all that sort of thing.

The present population of the territory of New Mexico is not less than 350,000 people; it has a larger population than any territory ever admitted to the Union as a state, and surpasses in population the following eight states already in the Union: Delaware, Idaho, Montana, Nevada, North Dakota, Utah, Vermont, and Wyoming.

Our population is made up about as follows: Three-fifths of it are people from the states and their descendants, making about 210,000 in number; the other two-fifths of it are native American citizens of New Mexico of Spanish descent, amounting to about 140,000 in number.



Twin Towers of the Cliff Dwellers in New Mexico

If New Mexico and Arizona are joined together, the new state, in addition to being second in the Union in area, will, as to population, in addition to the above, equal or surpass the states of Colorado, Florida, New Hampshire, Oregon, Rhode Island, and Washington.

It has been a state without a government for 58 years.

BIG OKLAHOMA

EXTRACTS FROM A SPEECH OF HON. BIRD S. MCGUIRE, OF OKLAHOMA, IN THE HOUSE OF REPRESENTATIVES

IN order that this House may have some understanding of our population, I desire to submit the vote of Oklahoma in connection with some other states at the last presidential election. I am advised that the Republican poll of the voting population of Oklahoma, as well as the Democratic poll, at the last election showed that there were about 137,000 voters in Oklahoma, and at that election, outside of county officers, there was no one for whom a vote could be cast other than a delegate. There was not the incentive to draw the people to the polls that there was in the states, where the presidential campaign was on; and at that election Oklahoma cast 110,000 votes, and the following states cast a less number: *

Alabama	108,845
Delaware	42,873
Florida	39,302
Idaho	72,578
Louisiana	53,908
Maine	96,027
Mississippi	58,383
Montana	64,444
Nevada	36,154
New Hampshire	90,089
North Dakota	70,175
Oregon	90,184
Rhode Island	68,856
South Carolina	56,912
South Dakota	101,995
Utah	101,624
Vermont	51,885
Wyoming	30,655

It will be observed that eighteen states cast a less number of votes than Oklahoma alone. Adding the vote of the Indian Territory to the vote of Oklahoma at that election would have easily reached the figure of 250,000 legal voters. The additional states of the Union which cast a less number of votes than 250,000 are:

Arkansas	116,411
Connecticut	191,116
Georgia	138,198
North Carolina	207,867
Virginia	130,540
Washington	128,713
Nebraska	224,708

There are a few others, which I do not recall at this time; but there were thirty-two states which cast less than 250,000 votes and less than would have been the combined vote of Oklahoma and the Indian Territory at that time, and very much less than would be their combined vote of today.

IMMENSE BUSINESS OF TERRITORY

Oklahoma exported in the last year 13,920 carloads of wheat, 8,023 carloads of flour, 2,368 carloads of feed-stuff, 4,587 carloads of grain, 3,204 carloads of cattle, and 422,092 bales of cotton.

Conceding that the exports of the Indian Territory were as heavy as those of Oklahoma, to move them would require a train reaching from Washington to New York, New York to Chicago, Chicago to St Louis, and from St Louis to Washington.

Oklahoma has 345 newspapers, of which there are 30 dailies, 287 weeklies, 5 semi-monthlies, 19 monthlies, and four quarterlies. The Indian Territory has 142 newspapers, of which there are 19 dailies, 117 weeklies, and two semi-monthlies, the total number of newspapers published in the two territories being 487.

There are in Oklahoma 257 territorial banks and 95 national banks; in the Indian Territory, 144 individual banks and 118 national banks—more than has the great state of Missouri, and more, in fact, than have nine-tenths of the states of the Union.

Out of 86,908 families in 1900, 60,086 owned their own homes, 50,483 of these

* New Mexico cast 43,011 votes for territorial delegate in 1904, and Arizona 19,667 votes.

Photo from H. C. Hooker, Department of Agriculture

A Round-up on the Sierra Bonita Ranch, Willcox, Arizona

being without mortgages or incumbrances of any kind. The percentage of families owning their own homes is greater than any state in the Union except three, and the percentage of homes free from debt is greater than any state in the Union.

Thirty-one states have a greater amount of illiteracy than Oklahoma. The percentage of illiteracy among the males of voting age is exactly 5.9, exactly the same as the state of New York. It is less than Massachusetts, Pennsylvania, or the District of Columbia.

Manufacturing is only beginning to develop. In 1905, 637 factories had capital employed $11,074,267 and an output of $16,433,430 and 3,492 wage-earners.

Oil fields are rich, one field alone producing 11,000 barrels per day and 50,000,000 feet of gas per day.

Shawnee, Oklahoma, is the largest potato-shipping point in the United States, 5,000 cars last season bringing in $100,000 clear profit.

The two territories have 6,000 miles of railroad, and within the last six years one-third of the railroads built in the United States was in those territories.

In behalf of 2,000,000 people I earnestly advocate the passage of this bill (the statehood bill).

THE ISLE OF PINES

THE Isle of Pines, also called Reina Amalia, lies in a deep bight off the south coast of the western part of Cuba. Its area is 986 square miles, or 631,040 acres, but 99 square miles less than the land superfices of the state of Rhode Island. The greatest length is from northeast to southwest, 43 miles, and breadth at the center from east to west 32 miles, and in the south 43 miles.

The island has a geological relation to the general chain of insular mainlands of the Antilles, and is unlike the numerous low coral and sand formations known as keys and mangrove swamps scattered in such profusion off the coast. In general the surface is a plateau from 50 to 100 feet above sea-level, broken by ridges of hills or cliffs that project abruptly above the general surface.

The two mountain ridges at the northern end reach an elevation of about 1,500 feet and are composed of limestone and marble. The other ridges in the center are much lower, less precipitous, and formed of gray sandstone, red rock, and gravel containing iron.

The whole island, with the exception of the rocky southern coast, is surrounded by mangrove swamps, with here and there a stretch of sandy beach.

The island has a number of rivers of excellent water, the most important of which, emptying on the north coast, is the Nuevas, composed of several mountain tributaries 5 to 10 feet deep and navigable 4 or 5 miles.

THE MINERAL SPRINGS

The mineral springs, for which the island has a world-wide reputation, judged from official and individual certification as to curative properties and results of the waters, are remarkable, especially in pulmonary, rheumatic, and throat affections.

A chemical analysis shows the waters to be impregnated with oxygen and carbonic acid gases, chloride of sodium, sulphate of lime, carbonate of lime, iron, magnesia, chloride of calcium, nitrate of lime, silex, and extractic organic matter. Temperature of water, 82 degrees F. The regimen of treatment is two baths of a quarter of an hour each and four glasses, taken inwardly, per day. The baths are erected over the springs. The testimonials of the beneficial effects of bathing and drinking are numerous,

From J. O. La Gorce

One of the Streams of the Isle of Pines

among others being a case of bronchial trouble requiring caustic treatment of the throat which was cured in ten days and without a recurrence of the complaint. It is claimed that the waters rival Saratoga in the United States.

From J. O. La Gorce

A Spanish Laurel, 110 Feet in Width, Isle of Pines

THE CLIMATE EXCELLENT

The climate is described as "delicious, the air pure and balmy, and, notwithstanding the island being surrounded by water, is considered dry. The winds coming from the sea and passing over the pine forests are gentle and invigorating." The year is divided into two seasons. During the wet season, or summer, the rains begin early in June and last until October, seldom more than two hours in the afternoon, and are accompanied by thunder and lightning. The greatest rainfall is in May, June, and July, although there is no month entirely free from rain. During this wet season about two-thirds of the precipitation of the year is received. The day is usually clear until 10 a. m., after which it is showery until night. The nights are clear. The hottest hours are from 10 to 12 a. m. About 2.30 p. m. the breeze blowing in from the sea moderates the temperature. At night the copious dews contribute to the luxuriance of vegetation.

The dry season, or winter, extends from October to June, with occasional visitations from November to February of cold winds blowing from the north lasting about 48 hours, when the temperature falls to fifty, but is not as uncomfortable as the March winds in the States. This season is not entirely without precipitation, the days of rain numbering about one-third of the wet season. The annual rainfall ranges from 50 to 52 inches, or less than on the Gulf coast of

the States. The average rainy days are ten in the month, and the average humidity for the year 75 per cent.

The annual temperature of Habana, less than ninety miles in a straight line north, is mean maximum, 82½ degrees to 84 degrees F.; mean minimum, 71 degrees. The highest temperature on record is 100.6 degrees and lowest 49.6 degrees. The mean annual temperature is 75 degrees. The heat is oppressive on account of the moisture. The prevailing winds of the Isle of Pines are the northeast trades, which blow with but little variation throughout the year, rendering the nights cool both in winter and summer. The range of temperature between summer and winter rarely exceeds a mean of 11 degrees.

POSSIBILITIES OF DEVELOPMENT

Dr C. Willard Hayes, of the U. S. Geological Survey, says of the island:

"Considered from the economic viewpoint, the Isle of Pines is scarcely to be compared with Cuba. Its soil is not adapted for sugar raising, though certain parts are probably as well adapted to tobacco culture as the famous Vuelta Abajo district. Much of the island would doubtless produce fruits, as well as cacao, which latter is one of the most profitable crops grown in the tropics. The industry for which the island appears pre-eminently fitted is grazing, and it will doubtless in time become an important source of supply for cattle and sheep for the West Indian markets.

"It is also destined to become an important health resort, and all conditions of climate, vegetation, and scenery combine to render it attractive both to invalids and others who wish to escape the severe northern winters.

"The mineral resources so far as at present known are confined to marble, but of this there is an unlimited amount of different grades, suitable for a great variety of purposes. It is possible that iron and manganese may both be discovered on the island in commercial quantities.

"Unfortunately the island is without deep harbors, which largely neutralizes its value from a military standpoint."

There are about 1,000 people on the island, mostly Spanish and colored. In the last several years a large colony of Americans has grown up. The island belongs to Cuba.

THE PEOPLE OF MOROCCO

"THE population of Morocco has been variously estimated at from so trivial a number as four million up to seventy million, but as none of our authors who have made these statements have been able to base their reports upon any census, it is the vaguest kind of guesswork," said Mr Ion Perdicaris in a recent address to the National Geographic Society (to be published in an early number of this magazine). "The country gives to strangers who do not know it the impression of being very sparsely populated because the natives avoid the neighborhood of the highroads. This is due to the continual passage of troops and because the inhabitants are also subjected to what is called the system of supplying 'moona,' a system which enables travelers to procure letters from the government; and these letters entail upon the inhabitants of the roads the necessity of supplying food, not only for the travelers themselves, but for all their escorts. It is a very serious tax, and the natural consequence is that the inhabitants avoid the neighborhood of the highroads as much as possible. Therefore the travelers going back and forward see very few inhabitants in the very few villages that still remain. But the people who know the country better—the merchant and others who travel in the country itself—realize very soon that it is very much more densely occupied than would appear from the highways."

From stereograph copyright 1906 by Underwood & Underwood, New York

The Sultan of Morocco in the Uniform of a Zouave

Owing to the prejudice of his subjects against foreigners, no one except the Europeans at the Court saw him in this costume. The photograph was taken in his own private studio at Fez

PROGRESS IN SURVEYING THE UNITED STATES

MR O. H. TITTMANN, Superintendent of the U. S. Coast and Geodetic Survey, in his official report for 1905, gives the following interesting summary of the year's work: "The most notable feature of the work of the year is the completion of the line of precise levels connecting the Atlantic Ocean and the Gulf of Mexico with the Pacific Ocean. The three principal connections with sea level are at Sandy Hook, New Jersey; at Biloxi, Mississippi, and at Seattle, Washington. The distance between Sandy Hook and Seattle along the shortest line of leveling of the highest degree of accuracy is 7,400 kilometers, and the similar distance between Biloxi and Seattle is 5,700 kilometers. This leveling is a portion of the precise-leveling operations which will eventually furnish standard elevations in the United States, upon which the extensive operations of the Reclamation Service can be based and for use of geographers, civil engineers, and surveyors, and for physical investigations relating to the planet on which we live. The leveling operations have been thoroughly checked by closed circuits as far west as Norfolk, Nebraska, and the closure of the line westward on mean sea level at Seattle, a distance of 3,300 kilometers, with a small discrepancy which

From U. S. Coast and Geodetic Survey

Coast Survey Party Loading Outfit into Canoes, 1¼ Miles from Shore, Yukon Delta Coast, Alaska

The bed of the ocean is so little inclined that each succeeding tide floods an area of many hundreds of square miles. With the ebb this vast expanse is completely drained, and then presents to the eye an unbroken surface of mud and offers the traveler a most uninviting and difficult footway.

is within the allowable limits of error in levels extending over this distance, is most satisfactory.

"Work on the opening and remonumenting of the international boundary between the United States and Canada west of the Rocky Mountains is making satisfactory progress under my direction and that of the Director of the United States Geological Survey, as commissioners on the part of the United States.

"The demands of the navy for assurance that no undiscovered dangers to navigation existed in certain waters was met by the construction of a wire drag 1,000 feet long, and a method was devised by which this drag, set to any desired depth, can be pulled through the water over all portions of any bay or harbor. The drag catches and immediately reveals any hidden rock or any danger to navigation. This drag was successfully used in Frenchmans Bay on the coast of Maine.

"In response to a request from the Isthmian Canal Commission, a survey was made of the Bay of Limon and approaches to Colon, in the Canal Zone.

"The triangulation was extended from Mount Shasta, in California, to Eugene, Oregon; in Minnesota, from the North Dakota line to Aitkin; in Texas, from Floresville to Alice, and was in progress in Minnesota and in Washington, north of the Columbia River, at the close of the year. The progress along the ninety-eighth meridian was more rapid and at less cost than during any previous year.

"A continuous record of the variations in terrestrial magnetism was obtained during the year by photographic means at the magnetic observatories at Cheltenham, Maryland, at Baldwin, Kansas, at Vieques, Porto Rico, at Sitka, Alaska, and at Honolulu, Hawaii. Incidentally meteorological and seismological observations were made at these observatories.

MAGNETIC STORMS

"The year was notable by the large number of magnetic storms which sensibly affected the compass direction, this being the period of maximum sun-spot activity. On the average there have occurred two such storms monthly, which deflected the compass by one-quarter of a degree and more. A comparatively large number of earthquake records were also obtained during the year, the most notable one being the Indian earthquake of last April.

"The magnetic survey of the country was extended by making observations at numerous stations (286) with portable instruments in 41 states and territories. Some magnetic observations were also obtained in the West Indies during the voyages of the Coast and Geodetic steamers *Bache* and *Explorer* to the Canal Zone and Porto Rico.

"Valuable results for the improvement and correction of the magnetic charts of the Atlantic Ocean were obtained on the cruises of the Coast and Geodetic Survey steamers *Blake* and *Bache* from Baltimore to the Maine coast last summer; also by the *Explorer* on her cruise to Porto Rico and back, and by the *Bache* on her trip to the Canal Zone.

"Similar results for the Pacific Ocean were obtained by the Coast and Geodetic Survey steamers *Patterson* and *Gedney* on their respective cruises. In all, magnetic data were obtained at about 50 different points in the Atlantic and Pacific oceans.

"In this connection mention should also be made of the effective coöperation entered into between the Survey and the Carnegie Institution of Washington, and it is expected that most valuable data will be obtained in the Pacific Ocean. This institution has taken up the systematic magnetic survey of the Pacific Ocean. It has chartered a vessel for this purpose and placed it under the command of one of the most experienced officers of the Survey.

ALASKA

"In Alaska the survey of Iphegenia Bay, Davidson Inlet, and Sea Otter Sound was continued. A survey was

Courtesy of Popular Science Monthly

Map of Alaska, Showing Unexplored Areas in 1905

made of Kiska Harbor at the request of the Navy Department. Surveys were also made in Resurrection Bay and in Prince William Sound. A hydrographic examination was made of the waters between Prince William Sound and Resurrection Bay at the request of the War Department, to facilitate the laying of a cable by the Signal Corps. The longitude of Sitka was determined from Seattle by the telegraphic method, and the work of determining the longitude of other points by the same method was in progress at the close of the year."

In the Philippines the charting of the coasts and harbors has advanced very rapidly.

HOW MUCH IS KNOWN OF ALASKA

MR ALFRED H. BROOKS, who has charge of the Alaskan explorations of the U. S. Geological Survey, gives the following summary of what is known of Alaska in the Popular Science Monthly for January:*

Explorations by U. S. Geological Survey	80,000
Geologic and topographic reconnaissance surveys	60,000
Explorations by other departments	50,000
Coastal province, shore line surveyed by Coast Survey and some geological surveys made by Geological Survey	120,000
Unmapped and practically unexplored	310,000
Total area of Alaska	620,000

Besides this, about one thousand square miles have been surveyed in great detail The above statement does not include the extensive special investigations of mineral resources which have been made, for which about 20 per cent of the total appropriations have been used.

It is difficult now to realize how little

*See contour map of Alaska published by the National Geographic Society.

was known of Alaska previous to 1896. The general courses of the larger drainage features were laid down on maps, but only in a very crude way. The coastal mountains were known, but the two great inland ranges, one of which contains the highest peaks on the continent, were hardly indicated on any map. Only a few of the passes were known, and the altitude of not a single point away from the coast had been established. Now all but two of the larger rivers have been surveyed, and contour maps have been made of over 150,000 square miles. All of the larger geographic features have been outlined by the network of explorations which have been extended over the entire territory. There are no new mountain ranges to be discovered, though there are several which are but imperfectly known.

In the purely geologic work the results are still more striking. While a decade ago only a few facts about the geology of the coast province were known, it has been possible now to prepare a preliminary map of the geologic features of over half the territory. The stratigraphic studies are of still greater interest, for they have shown the presence of many horizons in northwestern America that were previously unsuspected.

There is not a single mining district in Alaska which has not been reported upon. An inquiry in regard to the mineral resources of any part of Alaska coming to the office of the Survey is now met with a printed report containing the latest and most authentic information.

While much has been accomplished, much remains to be done. Over half the territory has not been covered by even reconnaissance maps. Even these will not suffice in regions of important mineral production, where often hundreds of thousands of dollars are being invested, and detailed surveys, comparable to those made in the states, are demanded.

Courtesy of Review of Reviews, Copyrighted

A Company of Norwegian Soldiers, Mounted on Their Ski, Ready for a Long March into the Icy Wilderness

In its relation to the federal government, Alaska differs from any other possession of the United States. Though heavily taxed, the 30,000 white residents have no voice in the making of their laws. Porto Ricans and Hawaiians have territorial government, the Filipinos have their commission, but Alaska must depend entirely on the benevolent paternalism of a legislative body 5,000 miles away.

A DICTIONARY OF UNIVERSAL GEOGRAPHY*

EIGHTY thousand places are listed and described in the new edition of Lippincott's Gazetteer, edited by Messrs Angelo Heilprin and Louis Heilprin and just published by J. B. Lippincott Co. The descriptions vary from one line to several pages. For condensed, accurate, and useful information as to the geography, geology, history, commercial condition, etc., of the world, this Gazetteer has no equal. The publishers have used a light but tough paper, so that in spite of the immense amount of matter included, the volume is easily handled.

Lippincott's Pronouncing Gazetteer, in its various editions, has been before the public just half a century, the first edition having made its appearance in 1855. The present publication, printed from new type from cover to cover, is a new work, embodying little more than the framework of its predecessor, together with its system of pronunciation. It presents a picture of the world in its minutest details in the year 1905.

For the United States a standard of inclusion has been adopted entirely different from that employed in the case of foreign countries. Almost every cluster of houses that in this country deserves the name of hamlet is supposed to figure in the pages of the Gazetteer. The Philippine Islands and other possessions of the United States beyond the seas are dealt with under a vast number of heads. For Canada the standard of inclusion has been made almost the same as that of the United States, and this is also true of Cuba, Mexico, the South American republics, and the South African colonies.

The political and commercial changes in the last ten years have been incorporated, and also the latest results in polar work, in mountaineering, etc.

"No survey of the field would be adequate without a reference to the changes that have taken place during the recent years in the sources of the mineral supply of the world. The auriferous fields of the Transvaal Colony have developed into the richest on the face of the globe. Colorado has outstripped California in the yield of gold, and has become the foremost silver-producing state in the Union. Montana now boasts of the richest deposits of copper in the world, and Minnesota outranks Michigan in the output of iron. The product of the iron mines of Germany has eclipsed that of the mines of Great Britain. Sweden has risen to a new level among the iron-producing countries through the exploitation of the prodigious deposits of Gellivare, beyond the Arctic Circle. New Caledonia has found a rival in the district of Sudbury, Ontario, as a leading source of the world's supply of nickel. Immense stores of petroleum have been discovered in California, Texas, Kansas, and adjacent regions, vying with those of the Appalachian fields and the Ohio Valley. In the yield of this mineral Baku, on the shores of the Caspian Sea, has risen to the foremost position in the world. Prussia almost equals England in the products of its coal mines."

*Lippincott's New Gazetteer, A Complete Pronouncing Gazetteer or Geographical Dictionary of the World, containing the most recent and authentic information respecting the countries, cities, towns, resorts, islands, rivers, mountains, seas, lakes, etc., in every portion of the globe. Edited by Angelo Heilprin, of the Sheffield Scientific School of Yale University, late President of the Geographical Society of Philadelphia, Fellow of the Royal Geographical Society of London, etc., and Louis Heilprin, author of "The Historical Reference Book," etc. 2050 pp. 11 by 8 inches. Philadelphia and London: J. B. Lippincott Company, 1906. $10.00.

CORRESPONDENCE

ERRATUM

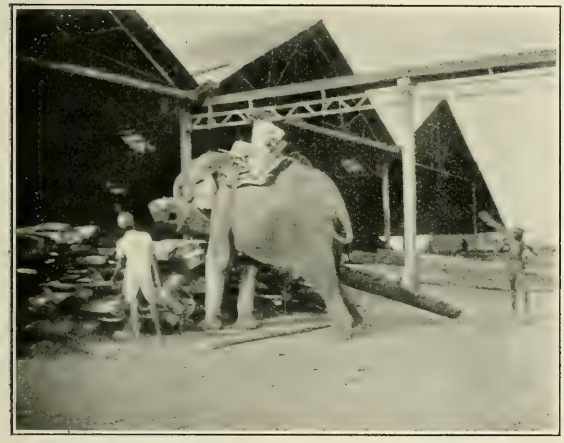
Through an error in proof-reading the statement was made on page 51 of the January number that the new Salton Sea of California covered an area "800 miles square" instead of "800 square miles."

PHILADELPHIA, *January 25, 1906.*

Editors National Geographic Magazine:

The photographs sent you were taken by me during a recent trip around the world. One and two illustrate industrial conditions in Rangoon, Burma, showing how elephants are employed in saw-mills to do the work which in more progressive countries is accomplished by steam. The third represents a native boy orchestra in Garoet, Java. The musical instruments are of bamboo cut in unequal lengths so as to form a sort of octave, and after being hollowed out the tubes are attached loosely together with thin strips of wood, so that when gently or forcibly shaken very agreeable music is produced. The instrument is called an Antlung.

Yours truly, EMILY BELL.



MOUNT VERNON, N. Y., *January 18, 1906.*

Editors National Geographic Magazine:

Replying to a query conventionally signed X. Y. Z., concerning Lower California, will you allow me to add to your reply the opinion that it is an excellent place to keep away from, if one is looking for business. There is scarcely a feature about the peninsula, from north to south, that is attractive to a white man. Along the coast plain, which is much interrupted by cliffs, there are but few localities in which the land could be made productive without a great expenditure of money and labor. The made lands in the vicinity of the mouth of the Colorado are productive where irrigation is possible, but the intense heat of summer unfits the region for any but people of tropical latitudes. The Pacific Coast region is more temperate in climate, but the area of productive land is very small. There are a few calling places for vessels—all small villages, inhabited mainly by half-breeds—but none is of importance. Tia Juana (Aunt Jane) is not far from National City and

Photos by Emily Bell, Philadelphia

San Diego, California. On the whole, it is a rather hot place; but then it is "just over the border." A trail, which in some places has been made a fair cart road, extends from Tia Juana along the whole extent of the peninsula to La Paz, the most important village, and thence to Lower San José. A Mexican colony might settle at various places on the peninsula and prosper fairly at fruit farming, but it is doubtful if a single location exists where an American colony could do anything but starve. Some of the mesa lands have an elevation of 4,000 feet. As a rule, they furnish fair grazing.

J. W. REDWAY.

NATIONAL GEOGRAPHIC SOCIETY

Popular Meetings

National Rifles Armory, 920 G street, N. W., 8 p. m.

Friday, February 2—"The Greek Monasteries at Mt Athos and the Greek Church." Illustrated. Dr Edwin A. Grosvenor, professor of international law in Amherst College. The Mt Athos monasteries were founded 1,500 years ago. Ten thousand monks live there now. No woman nor any female creature—not even a cow or a pussy cat—has set foot within the grounds during 1,500 years.

Saturday, February 10—"A Flamingo City and Bird Life in the Barbados." Illustrated. Dr Frank M. Chapman, American Museum of Natural History.

Friday, February 16—"Africa from Sea to Center." Illustrated. Mr Herbert L. Bridgman. Africa in transition today challenges the attention of the world. Few intelligent Americans know to what extent its possibilities have been developed since Livingstone's day, a development that in rapidity promises to exceed that of North America.

Saturday, February 17, at Hubbard Memorial Hall—"Across South America." Illustrated. Mr Alvah D. James.

Tuesday February 20—"My Captivity in Morocco." Illustrated. Mr Ion Perdicaris.

Friday February 23—"The Personal Washington." Illustrated. Mr W. W. Ellsworth of the Century Company. This is not a lecture in the ordinary sense of the word, but it is an exhibition through the medium of the stereopticon of the greatest collection of prints, manuscripts, and letters referring to the personal side of Washington ever brought together.

Friday, March 2—"Our Immigrants: Where They Come from, What They Are, and What They do After They Get Here." Illustrated. Hon. F. P. Sargent, Commissioner General of Immigration.

Thursday, March 8—"The Russian Peasant." By Frank G. Carpenter. Illustrated.

Friday, March 16—"Oriental Markets and Market Places." By Hon. O. P. Austin, Chief U. S. Bureau of Statistics. Illustrated.

Friday, March 30—"The Total Eclipse of the Sun, July, 1905, as observed in Spain." By Rear Admiral Colby M. Chester, U. S. N., Superintendent U. S. Naval Observatory.

Tuesday, April 13—It is hoped that official business will permit the Secretary of the Navy, Hon. Charles J. Bonaparte, to address the Society on "The American Navy."

Scientific Meetings

Hubbard Memorial Hall, 8 p. m.

Friday, February 9—"The Introduction of Foreign Plants." By Mr David G. Fairchild, Agricultural Explorer, U. S. Department of Agriculture.

Friday, March 9—"The United States Bureau of the Census." By Hon. S. N. D. North, Director, Bureau of the Census.

Friday, March 23—"The Death Valley." By Mr Robert H. Chapman, U. S. Geological Survey.

Friday, April 6—"Hunting with the Camera." By Hon. George Shiras, Member of Congress from the third district of Pennsylvania.

Friday, April 20—"The Protection of the United States Against Invasion by Disease." By Dr Walter Wyman, Surgeon General Marine Hospital Service.

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An Explanation of the Reasons Why the United States Should Abandon its Obsolete System of Inches, Tons, and Gallons. By ALEXANDER GRAHAM BELL. : : : : : :

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Please detach and fill in blanks and send to the Secretary

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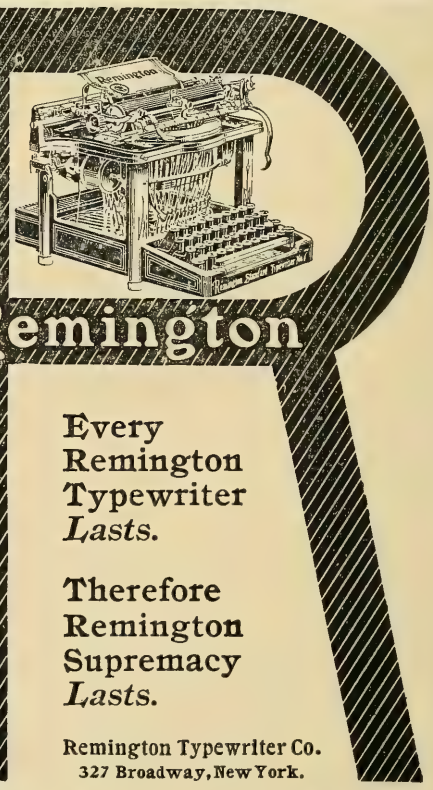

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THE NATIONAL GEOGRAPHIC MAGAZINE

MOROCCO, "THE LAND OF THE EXTREME WEST"

AND THE STORY OF MY CAPTIVITY

BY ION PERDICARIS

The following article is the substance of two addresses to the National Geographic Society, November 17, 1905, and February 20, 1906. In the first address Mr Perdicaris described the government and people, and in the second his capture by Raisuli and his experiences with that remarkable man. For the very unique and instructive pictures, excepting those on pages 136 and 137, the Magazine is also indebted to Mr Perdicaris, who sent to Tangier specially for them. The pictures on pages 136 and 137 are from photographs presented by Mr David G. Fairchild.

IN the attempt of the French to secure a permanent control in Morocco, in the intervention of Germany, and in the assemblage of a Moroccan conference at Algeciras in Spain, we may witness the prelude to the closing act in the drama of Moorish independence. Very possibly the young Sultan, Abd El Aziz;* may prove to be the last independent ruler of the Drisite dynasty—a dynasty which dates back no less than some 1,200 years.

According to the chronicler, Ibn Khaldun, in 788 Idris, a great-great-grandson of Hassan (who was a son of Ali and of Fatima), had fled from Arabia, and, passing around by the Desert of Sahara, had come up to Tangier, where he was amicably received by the Berbers. Ed Dris or Idris, as it is pronounced, was fleeing from the dread of death at the hands of the Khalif El Mehdi.

It may seem rather a far cry from circumstances connected with the present day to go back so far as to this date of 788; but, curiously enough, no less than four of the chief personages who were concerned either in my capture or in my subsequent release were all descendants of this very Idris: First, the Sultan of Morocco, who paid the indemnity of $70,000 in order to secure my release; secondly, the young chereefs of Wazan, who brought up a relief expedition to

*The Turkish form is Abdulaziz, the Arabic is Abd El Aziz.

bring me supplies and who remained with me; and, thirdly, Raisuli, who was my captor.

The fact which I gave you here concerning this Idris and a good deal of the other matter is taken from the first volume of M. De Slane, page 24, of "Le Tresor de Chronologie du Moyen Age de Maslatrie," which is one of the most complete and celebrated chronicles which we have. It had pleased me to place myself thus, as it were, on the boundary at Tangier between our Western life and the life of the East—of the old world. But it was one thing to look, as it were, from one's windows out upon conditions which were precisely like those of the time of Idris, or even farther back; it was quite another thing to be snatched away from one's home and friends and family and to be plunged into the lawless condition of such a period.

THE LAND OF THE EXTREME WEST

El Moghereb is the name by which Morocco is known in native official documents. The inhabitants, however, speak of their country as "El Gharb." This term, "El Moghereb," signifies the land of the extreme west—that is, of the extreme west of the African Continent. It is probably derived from the verb which means to *sink,* or the sunset; so that in English it is sometimes described as the sunset land. The varied domains of this vast territory—almost as large as either France or Spain—are protected from the desert winds which sweep over Algeria and Tunis by a barrier of snow-capped mountain ranges—those of the greater and of the lesser Atlas, forming, as it were, a huge backbone. And just opposite the Straits of Gibraltar a spur strikes out and runs down at right angles to the seacoast and terminates in an abrupt eminence known to the ancients as Mount Abyla and to the Arabs as Djebel Moussa. The range itself is known as the Riff Mountains, and offers a splendid barrier or defense toward the east—that is, toward Algeria. It was among these mountains that we were taken prisoners.

The population of Morocco has been variously estimated at from so trivial a number as four million up to seventy million; but, as none of our authors who have made these statements have been able to base their reports upon any census, it is the vaguest kind of guesswork. The country gives to strangers who do not know it the impression of being very sparsely populated, because the natives avoid the neighborhood of the highroads. This is due to the continual passage of troops, and because the inhabitants are subjected to what is called the system of supplying *"moona"*—a system which enables travelers to procure letters from the government. These letters entail upon the inhabitants of the roads the necessity of supplying food, not only for the travelers themselves, but for all their escorts; so that it is a very serious tax; and the natural consequence is that the inhabitants avoid the neighborhood of the highroads as much as possible. Therefore the travelers going back and forth see very few inhabitants in the few villages that still remain. But people who know the country better—the merchants and others who travel in the country itself—realize very soon that it is much more densely occupied than would appear from the highways.

THE BERBERS—THEIR ANTIQUITY

About two-thirds of this population are probably Berber or of Berber descent. These Berbers are the aborigines. They are a purely white race and a very energetic and vigorous people. The term "berber" itself is possibly derived from the Semitic root *ber,* which means land. Therefore "berber" would mean "land of the land;" or it may be simply a corruption of the Greek term "Barbaroi," applied by the early Greek navigators to foreigners in general, but more especially to all this coast along the southern shore of the Mediterranean. Hence we have

the nomenclature of the Barbary States, including Barka, Tripoli, Tunis, Algiers, and Morocco.

These Berbers antedated Phœnician, Carthaginian, Roman, Gothic, Byzantian, and Arab occupation by centuries upon centuries; it is probably one of the oldest races; and there are certain ethnologists at the present day, at the head of whom is an Italian writer named Sergi, who maintain that the theory of those successive invasions of Caucasians, about which we have all read, and which are generally believed to account for the origin of the races of southern Europe, did not furnish the main part of the population of the Mediterranean basin, but that the latter was derived from these Berbers, a white race which has many resemblances to the ancient Etruscans. They are quite like the pictures also of some of the ancient Egyptian dynasties.

THEY HAVE ALWAYS WITHSTOOD SUBJUGATION

These people have always been opposed to any attempt to bring them under control, and they have never been kept in subjection by any of these successive governments for any great length of time. Their desire is never to recognize any more authoritative control than that of their own village elders. It is from this race that the two great sects of the early church of the fourth and fifth centuries, known as the Donatists and Cercumceliones, are descended. These were really a sort of Christian nihilists, a sect which swept away many of the towns and villages of the Roman senators—a destruction which was finally completed by the great Arabic invasion which swept over much of that country, and which seems to have been itself on very friendly terms with these Berbers.

The Berbers, as you are all very well aware, joined the Arab invaders and formed a large contingent of the Saracen tribes who overwhelmed the Gothic kings of Spain. They did not speak of themselves generally as Berbers; they called themselves Schleuh, and described the various dialects of their tongues as of the Schilhak language. They could not even understand or communicate with the Arab tribes without an interpreter. Some of them learn Arabic, but many of them cannot communicate at all with their fellow Arabian laborers.

The name "Morocco" can be traced to the Roman designation of Mauritania, the natives being called in Spanish "Mauros," "Moriscos," and finally "Moros," and hence in English "Moors." The word "Morocco" may also be an effort at approximation to Marekshe, the southern capital of the country which we know as Morocco City. Whatever may be the origin of the term "Berber," these people speak of themselves as "Schleuh."

When the successive Arab invasions, beginning in 711, broke upon the country (that was in the year 200 of the Hegira) this Berber population was ultimately driven by the Arabs from the plains and from the richer valleys and forced to take refuge among the Atlas Mountains; and in these mountain ranges they have always remained, a thorn in the side of the Arab rulers and a great menace and danger to the people of the lowlands, whenever the central authority was weakened by a disputed succession with a feeble Sultan at the head of affairs.

THE JEWS ARE AN IMPORTANT FACTOR

There are two other important factors among the population—the Jews and the negroes. The Jews are mostly exiles from Spain and Portugal, having been driven out after the Moors had been expelled from Spain. The Jews were driven out by the Inquisition, and a great many of them came over to Morocco and settled there. Others went as far east as Turkey. Still others visited other countries. Those who settled in Morocco were almost all confined to a special quarter of the towns, entitled El Mellah. This word Mellah means salt, and it

comes from a very curious feature in the customs of the country. Whenever rebellions break out—and they are very frequent occurrences—the soldiers in Morocco have instructions to bring in as many heads as possible. These heads have to be preserved and salted, and nobody likes to execute this commission; consequently the Jews were compelled to undertake this revolting task.

THERE IS NO DISTINCTION OF COLOR LINE

Another element were the negroes from Soudan, from which the famous Bokhari guards were recruited. Some of these negroes occupied very high official positions. I may say, as it is an interesting question to us here, that after the death of the late Sultan of Morocco there was an interregnum of six years before the young Abd El Aziz was old enough to take the reins of power. During that time a negro regent named Ahmid ben Maussa governed, who was one of the most able rulers Morocco has ever had. He kept the country in perfect order and was very much respected by all who knew him.

There is no distinction of color line in Morocco. The question is simply what is a man's capacity. It does not matter what the shade of his complexion is in the least. The gentry of the country are mostly drawn from those Moors who were expelled from Spain, and who returned to Morocco. All those who have any descent from the Prophet are called Chereefs. This word is derived from the root "Churf," which means to grow old—to grow old with honor. To say that anything is *churfa* means that it has become distinguished through time and circumstance. So that this is a sort of title of nobility—religious and secular.

THE BETTER FAMILIES

Some of the better families still claim that they preserve the keys of the houses occupied by their ancestors in Granada, Cordoba, and Toledo and the other Spanish cities. The women of some of these families at the notheastern capital, Fez, wear embroidered upon their high scarlet head-dresses a golden key, a sort of symbol of this descent. I know some of these families who claim to still possess these keys, but I have never seen any of the keys. One consequence of the apparently long residence of the ancestors of these particular families in Spain is the extraordinary fairness of the complexion of a great many of their descendants even at the present time. For instance, the minister of foreign affairs at Tangier, Hadj Mohammed El Torres, whose name you sometimes see in the papers, is as fair as any person in this room, and, as his name indicates, he is a descendant from one of these very families from the city of Tetuan. The explanation of this fairness of complexion is supposed to be the well-known fact that many of these Mohammedan chieftains of Spain intermarried with Gothic women. They are very proud of this and strive to keep it up and not to cross their blood. Consequently strangers who visit Morocco are very much astonished to find so many absolutely white men.

THE SULTAN HAS NEVER ACKNOWLEDGED ALLEGIANCE TO ANY OTHER POWER

The Sultan, as you all know, is an autocrat. Neither he nor his ancestors have ever acknowledged allegiance to any other power. The confusion which exists on this point among so many people in this country is due to the fact that the neighboring province of Algiers was for a long time under the control of Turkey and was governed by Turkish beys. But the Sultan of Constantinople, who greatly desired to extend his control over Morocco, was never able to do so on account of the opposition of the dynasty and especially the strong opposition of the Berber tribes inhabiting the range of hills between Morocco and Algeria. They never allowed the Turkish government or its representative in Algeria to get a foothold in their own territory.

The authority of the Sultan may be described as somewhat tempered by the Ulema. These Ulema are the "learned in the law." The name comes from the verb "elm" or "ulm," which means "to learn." They, together with the Chereefs and the Marabouts, are really the only authentic representatives of popular opinion in a country where there is no press. One of the greatest mistakes that this young Sultan committed after the death of that great negro regent was that he paid no attention to the opinion of these Ulema. He has had occasion since to greatly repent of this error.

THE LAWYER IS ALSO A CLERGYMAN

There is no distinction between professors of law and theology in any Mohammedan country, for the reason that the whole code is extracted from the Koran itself; it is based upon Koranic precepts or on the various Hadiths. The Hadiths are the traditions, the sayings, attributed to Mohammed or to his immediate successors. From this work we get the whole body of the law; so that any one who is a member of this class of the Ulema or who, in other words, has taken his degree at the university or at the great mosque of Idris may be either a cleric (or divine) and go into the mosques and preach, or he may enter the mosques to devote himself to education as a professor. It all depends upon his power to attract classes. He does not have to ask permission from any authority, but can take up his quarters and hold forth, as lawyers and clergy all pass through exactly the same education and can occupy at pleasure one post or the other. Indeed, my family solicitor at Tangier was an incumbent of the principal mosque there and read the service regularly every Friday. He was a capable gentleman and, so far as my experience with him went, a very honorable and straightforward character, with a good deal of capacity.

Now, unfortunately these traditions do not come to the people directly. They have gone through the hands of a series of commentators, from whom are derived the different religious sects, of which there are four very prominent ones. They are called the Hanifi, the Chaafi, the Hanbali, and the Malaki. This last is the prevalent sect in Morocco. The only Mohammedan countries I know which are followers of this particular rite, which is the most narrow of all the sects of Mohammedanism, are Morocco and Afghanistan in Asia.

To come back to the situation in Morocco, I should tell you a little about the peculiarity of the government. The government functionaries, from the Sultan down to the lowest grades, form what is called the Mekhazen, which is derived from a verb "hzn," meaning "to bind."

I believe the word was first applied to that portion of the land or of the crops which, according to tradition, was set aside for the government and over which administrators were appointed. As the Sultan of Morocco and his cabinet ministers were the chief administrators of this treasury or magazine, they are the beneficiaries of the term and they are called the Mekhazen. The government of Morocco is always spoken of as El Mekhazen and the officials, from the Sultan down to the guards and minor employees, are termed Mekhaznia. Curiously enough, from this word Mekhazen, meaning "a warehouse," we probably get our expression "magazine."

The Sultan resides half the year at Fez, founded in 807 by the same Idris, and the other six months at Marakche, founded in 1130, during the reign of Abd El Mumin, the monarch who built a great tower at Rabat and who also played a great role in Spain. Some of the principal Saracenic buildings there were erected under the influence of his reign.

THE DIPLOMATIC CAPITAL

Tangier became the diplomatic capital on account of the extreme inconvenience

to the foreign legations, with all their ministers and family establishments, of being obliged to follow the court in its continual migration from one capital to the other, across the country where there are no roads and many dangerous rivers to be traversed. Therefore the foreign consuls who would not have been safe in the interior remained at Tangier, and the Sultan appointed officers and delegated ministers of foreign affairs and of finance to treat with them at Tangier. Hence it is only occasionally, when some question of great importance has to be negotiated, that special missions are sent to the capital where the Sultan happens to reside. It is a very great affair, the departure of these special missions with their numerous guards. Great preparations are required, and it is quite an imposing sight to see the minister with his secretaries and attachés and his own legation guards, together with the imperial escort and standard in front, leaving Tangier on one of these expeditions.

The name by which Tangier is known to the Arabs is Tanja. Tanja means clay. It also means a little clay vessel for cooking that the natives employed. Curiously enough, the classic name was Tingis, which is not very far removed from the term Tanja. I suppose we got our expression Tangiers from an attempt of the English geographers to make the name conform to Algiers. Now Algiers itself is quite a misnomer, because the Arabic name for Algiers is El Gezire, meaning the city of the isle, from an island off the coast. They called the province itself "Ber El Gezire," the Land of the Island. The Roman name of the province about Tangier was Tingitania, established during the reign of Emperor Claudius.

TANGIER AT ONE TIME BELONGED TO ENGLAND

In 1580 Alphonso of Portugal occupied Tangier, and in 1662 it was ceded to England as a part of the dower of the Princess Catharine Braganza when that princess married Charles II of England. Another part of her dower was Bombay, which was the origin of the great Anglo-Indian Empire. The Moors were just as well armed as the British in those days, and, owing to the improvidence of Charles II, they were a good deal better fed, because the garrison which occupied Tangier was left so unprovided with food that upon some occasions the men were obliged to sell their armaments and shoes and clothes in order to get a little money to buy bread. In those days the arms of the Moors were probably superior to those of the English, and the latter were not able to hold the place long, owing to the constant attacks of the Moors. There are, however, some very well-known names that appear on the register during that English occupation of Tangier. We have the Earl of Teviot, Lord Dartmouth, Pepys, notable for his diary, and the Rev. Launcelot Addison, the father of Charles Addison, the writer; and in a work which is extremely interesting, by Lieutenant Colonel Davis, "The History of the Second Queen's Royal Regiment" (now the West Surrey), it is stated that John Churchill began his military service in Tangier under the command of Colonel Kirk, who played such a sanguinary role in the Cromwellian wars of England during Jeffreys' sanguinary assizes.

In reading John Morley's life of Oliver Cromwell I found to my great surprise that one of the regicides, General Fleetwood, who married Oliver Cromwell's daughter, was confined in the Moorish castle at Tangier; and there is a letter on record from his wife petitioning that he might be removed to some establishment in England, where she might provide him with the necessities which his station required. This particularly interested me, as my youngest stepson, who has frequently resided with me in Tangier, is a direct descendant of this same General Fleetwood.

Another little incident that amused me

View of Tangier, with the Bay Showing to the Left of the Spectator

Dar El Beit, or the Treasury in the Fortress at Tangier

To the left the Kalifa or Governor's lieutenant administers justice, while the arched doorway at the end of the street gives access to the Governor's Palace, where the Basha himself sits in judgment

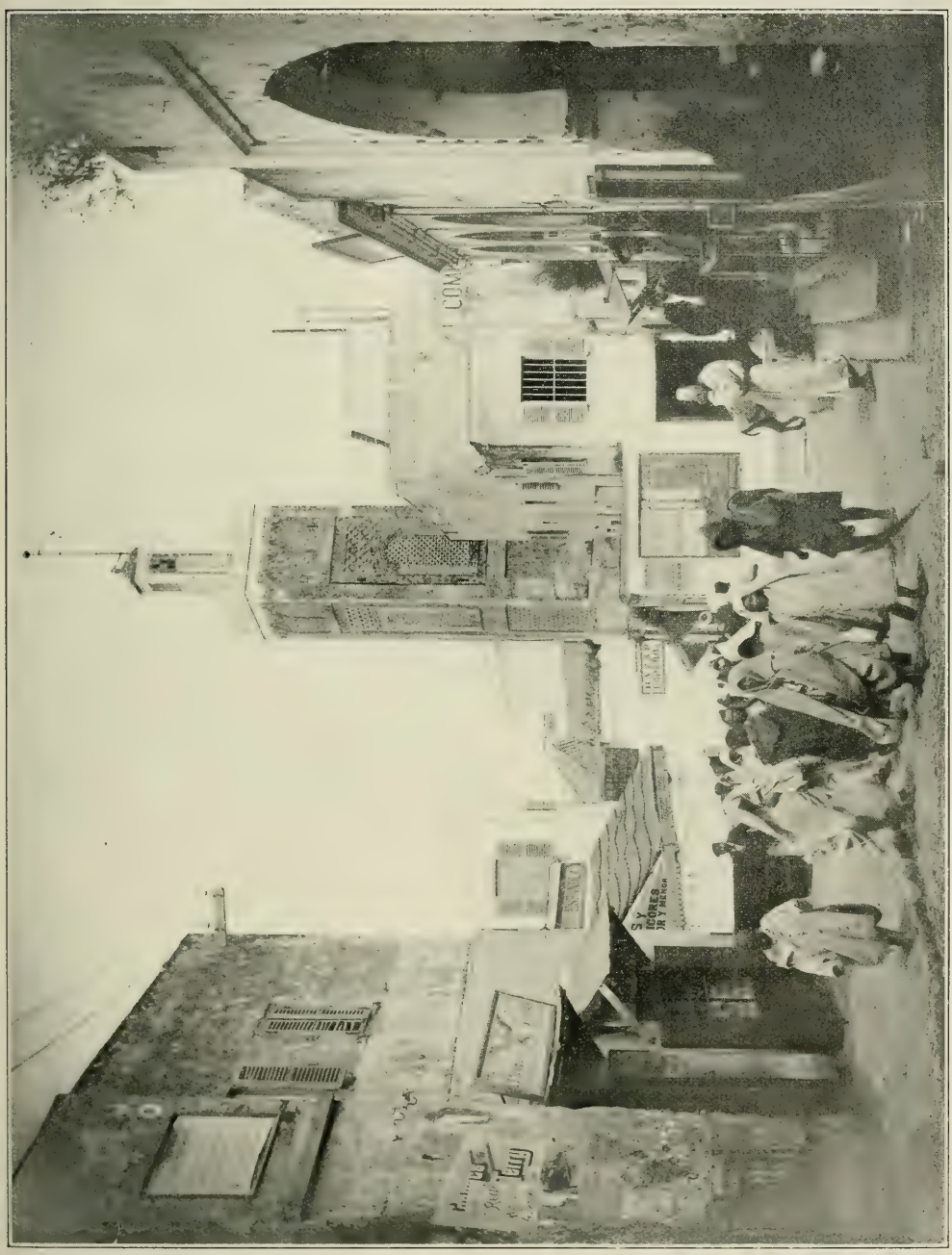
Saints' Shrines at Tangier

A Moorish Saint of Most Unsaintly Character, 6 feet 5 inches in height

A Peasant Berber Woman with Her Child, coming into Tangier along the Beach, Probably from the Province of Angera

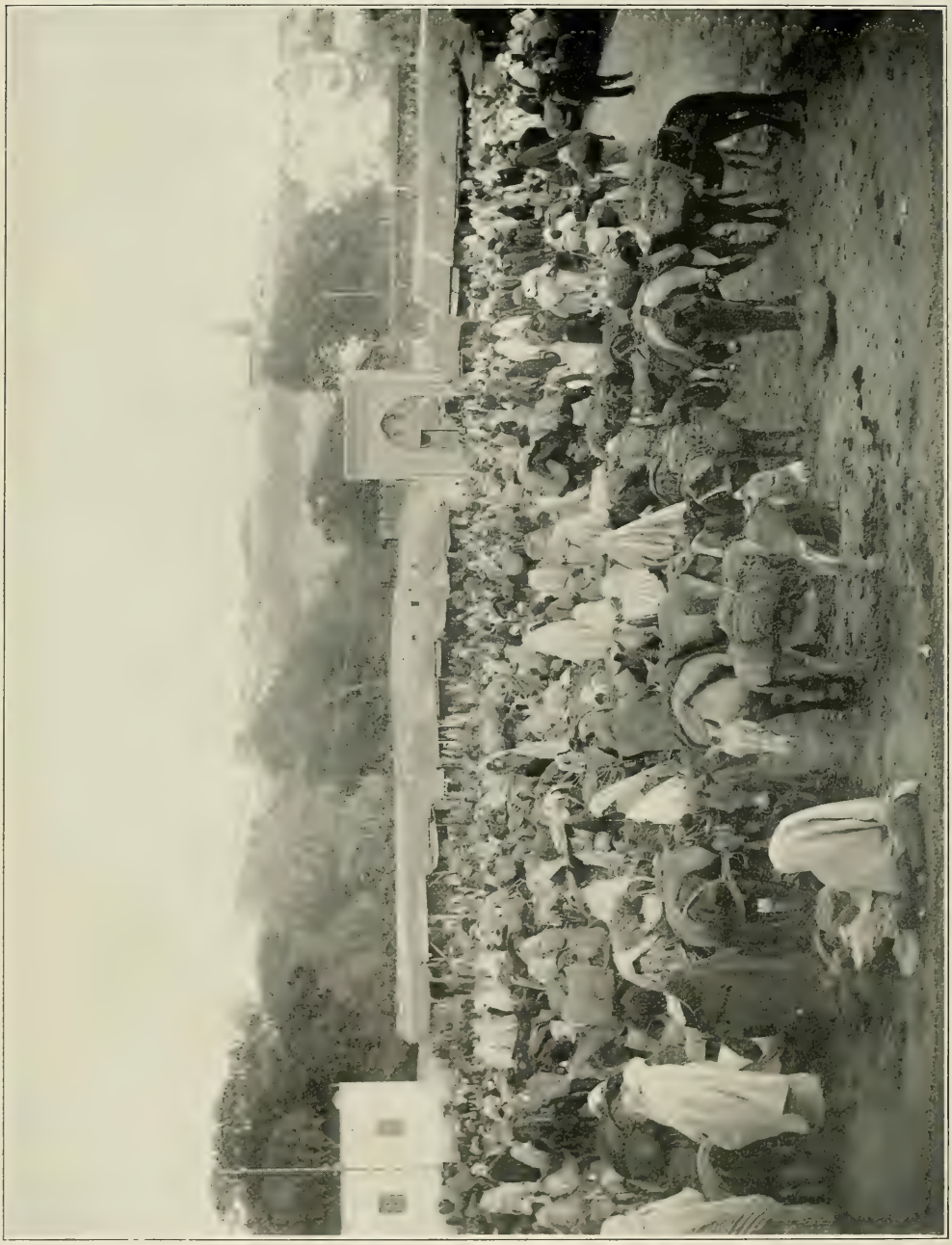
Market Day. Pots and Pans!

As this scene appears today, so it has been, without change, not merely during centuries but for ages past. The Moorish name Tanja (Tangier) signifies the clay from which these articles are made by the potter



The Main Street of Tangier or the Ciagreen, *i. e.*, the Street of the Silversmiths

With the tower of the principal Djama or Mosque, whence the call to prayers is issued at dawn, midday, and eventide



The Gateway of Bab El Fhas, with the Kasbah or Fortress of Tangier in the Background

It is market day and the Soko or market place is crowded by vendors and purchasers from the neighboring districts

Laab El Barnd or Powder Play upon the Soko or Outer Market at Tangier

The Villa de France Hotel is seen on the highground to the left, while the British Legation further off is visible directly above the smoke from the discharge of native arms in the center of the picture

The Entrance to Tangier through Arches of the Custom-house

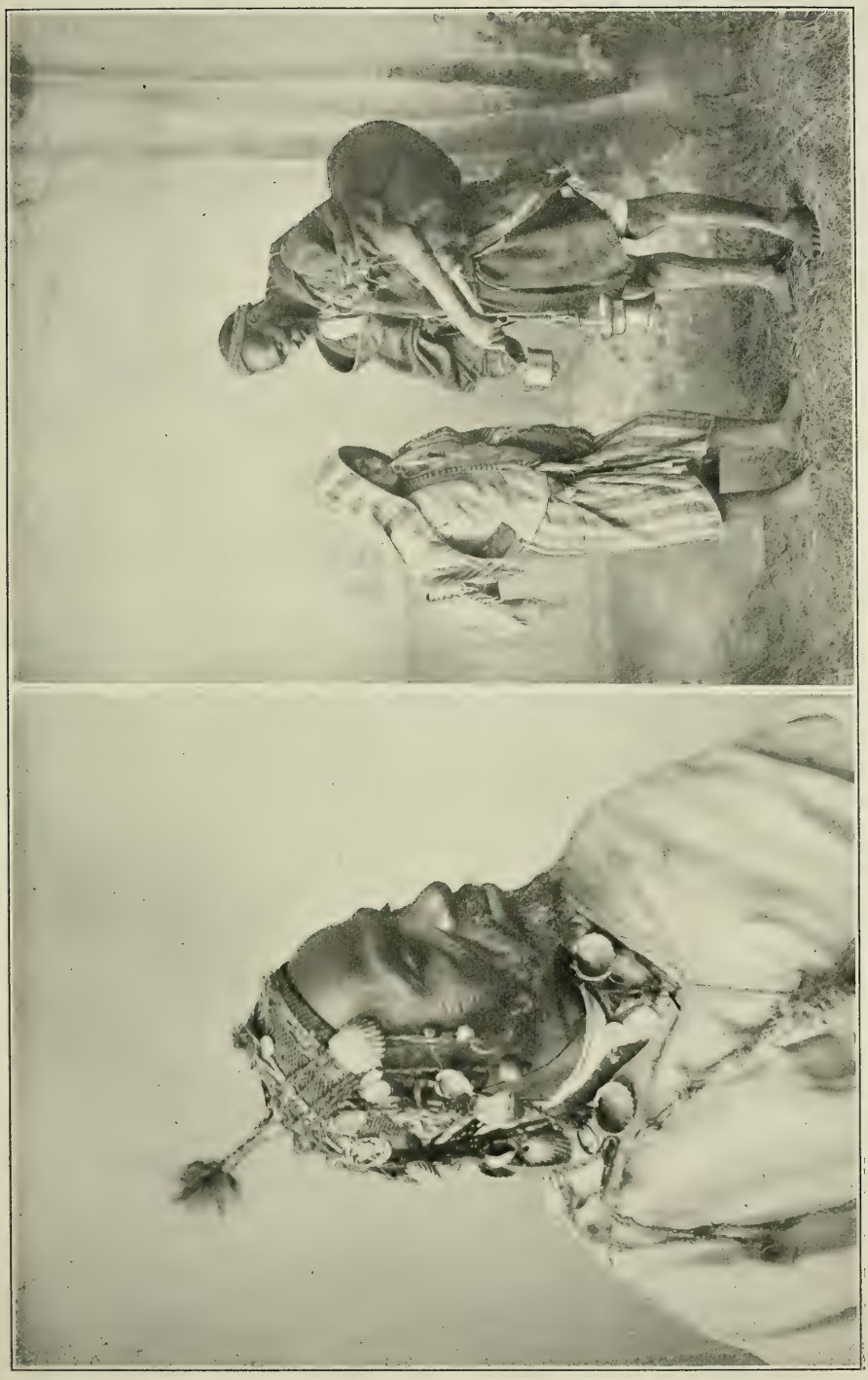
From a photo by Underwood & Underwood, Copyrighted

Crossing a Stream in Morocco, near Fez, one of the two Capitals

A typical view of the country

A Typical Moor of Tangier

One of Raisuli's Men—a Berber



Peasant Girl and Water Vendor at Tangier—Negroes

A Soudan Minstrel

Photo from David G. Fairchild

A Type general throughout Morocco and its Neighbor, Algeria

Photo from David G. Fairchild

A Moorish Belle

Aidonia, the Summer Residence on the Spartello Headland of Ion Perdicaris

The scene of his capture by Raisuli. The house faces the sea, which is obscured in this picture

was that on coming here on the steamer last spring I was told on board ship that there was a family in New York called Tangier Smith; that the founder of this family had been one of the English officials at Tangier during the English occupation of those 22 years, and that the family had always been known as Tangier Smith; that the official in question returning to England had secured a grant of land in Long Island from King Charles, and had thus helped form one of our oldest settlements in colonial times. I was wondering whether my informant was not inventing all this for the sake of telling a good story; but when I went to one of the hotels in New York the very next name to mine on the register was Mrs. Tangier Smith.

Up to about 1839 the naval power of the Sultan was supposed to be equal to repelling any aggression by any of the greater maritime powers, and some of the minor European states actually paid an annual indemnity to the Sultan of Morocco in order to protect their flags from aggression by the Salee rovers.

The Sultan fitted out these pirate ships to go forth and capture vessels and bring them into port and hold the crews for ransom. If they were not ransomed the crews were sent up in the interior to work in gangs.

The suppression of the rovers was largely due to the attitude taken by the United States, together with other powers like France and England, and to men like Decatur and Stockton.

View in the Grounds of Aidonia. The Flower Garden

THE ENTRANCE OF FRENCH INFLUENCE

On August 6, 1844, the French bombarded Tangier. This was a retaliation for the protection which the Moorish government had afforded the Emir Abd El Kader, who had taken refuge with his forces upon Moorish territory when he was pursued by the French. In 1860 a Spanish force under General Primm marched up from Seutta to Tetuan and took that town after six weeks of severe fighting. Afterward the Moors recovered the place by means of a heavy indemnity; but they had learned one great lesson, viz, that the wild charges of their own cavalry were helpless to protect them against troops who were supported by modern field artillery. This event led to an extraordinary change in the attitude of the Moorish government and people toward foreigners. However, this more amicable behavior of the natives was not due to any liking for us, but rather to the fear entertained of their own authorities, who, under pressure from the foreign consulates, punished with extreme severity any aggressions.

The natives soon learned to value the intervention of foreigners in their behalf, and even sometimes paid a considerable price for such protection against the cruel exactions of their own governors. Not only did foreigners enjoy a remarkable security, at least in the neighborhood of the coast, but their position during the entire reign of Umlai El Hassan might be described almost as that of privileged guards of the nation—a position which I regret to say was often abused by officials and especially by the native protégés of the various consulates.

THE BEGINNING OF DISORDER

In 1894 Umlai El Hassan died. This Sultan was perhaps the ablest ruler Morocco ever enjoyed, and was as remarkable for his personal appearance as for his courteous manner and signal merits. His young son, Abd El Aziz, nominally

The British Consul at Tangier, to the left, and to the right Kaid Sir Harry Maclean, late Commander and Military Instructor of Sultan's Forces

succeeded to the throne upon his father's death, but did not assume the reins of power until the decease, in 1900, of the Great Vizier, Ben Hamed Ben Mousa. A year or two later an adventurer known as Gilali El Zarhmni, an alleged elder brother of Abd El Aziz, and many of the Berbers in the neighborhood of Fez, rallied around this Pretender and even threatened Fez itself. For a short time the Sultan's troops were so aroused that many of them deserted with their arms to the enemy, and the Sultan himself barely escaped capture. Since this experience Abd El Aziz has not ventured to leave Fez, excepting for a few weeks on a single occasion, lest the city should open its gates to the Pretender.

The weakening of the Sultan's hold upon power was followed by a marked alteration in the attitude of the natives toward foreigners—Europeans or Americans.

It was evident that the singular immunity and advantages we had so long enjoyed no longer existed, and it became a question as to whether it was wise to remain in the country. There were, however, many reasons why I hesitated to abandon my considerable interests in the country. I was at the time president of an international commission charged with the administration of the town of Tangier; nor did I imagine that I myself would be exposed to any immediate danger, much less that I should be carried off as a hostage by the Berbers, or that the squadrons of our navy and the orders of my release here in Washington would become factors in the immemorial struggle between the Berbers of El Moghereb and the Sultan of Fez and Morocco.

THE SURPRISE AND CAPTURE

We had moved up two days before this startling event to Aidonia, our summer residence, on the Spartello headland about 5 miles from Tangier. The house which we had here erected is an unpretentious villa overlooking the entrance to the Straits of Gibraltar and surrounded by grounds some 300 acres in extent, embracing many varied features of woodland and of precipitous rock. This lovely locality has, however, been sadly spoiled for us by the alarm and insecurity caused by the Raisuli raid.

Remains of a Roman Bridge not Far from Tangier

The memory of that evening is indeed associated with an ineffaceable sense of horror. We had gathered in the drawing-room directly after dinner, when we were startled by loud screams from the servants' quarters. Followed by my stepson, Mr. Cromwell Varley, whose wife and two daughters, just home from school at Geneva, completed, with Mrs. Perdicaris, our family circle, I rushed down a passage leading to the servants' hall, where I came upon a crowd of armed natives.

Even then we did not realize our danger, but thought these intruders might be a party from a neighboring village. Our night guards were supplied from this hamlet, and we supposed that they, like ourselves, had rushed in to learn the cause of the uproar, which we, at the moment, attributed to some renewal of a quarrel that had broken out on a previous occasion between a young German housekeeper and our French chef de cuisine, when the latter, irritated by some insulting allusion to the French defeats at Metz and Sedan, had attacked the housekeeper, when, as now, we had been startled by her screams.

As I turned to inquire of these natives who crowded about me as to what had occurred, I saw some of our European servants already bound and helpless and, at the same moment, we ourselves were assailed by these intruders, who struck us with their rifles. At the same instant

our hands were roughly twisted and bound behind our backs with stout palmetto cords that cut like knives.

Varley, who made a fierce resistance, was handled with more violence. Indeed I thought the rifle blows would split his head, while his hand was cut to make him let go his hold upon one of the gang, whom he had liked to have strangled.

At this moment the housekeeper, hearing our voices, rushed across the hall from her dining-room, where she had locked herself in, and, just as we were driven out of doors, we saw a blow aimed at her head and she fell to the floor. This was the last we saw, then, of any one in the house where I have never since set foot.

Once outside, our assailants endeavored to drive us down to the stables, but we managed to make our way toward a guard-house, where a couple of government soldiers were stationed rather as gatekeepers to attend visitors than for any purpose of defense.

A Group of Camels Passed on the Way to Tsarradan. The Site of Our Captivity

RAISULI

By a lamp in front of this building we saw our guards, our gardeners, and other native servants under cover of the rifles of another party of mountaineers, while a little apart stood their leader, a man of fine presence, attired in the handsome dress worn by the native gentry. One of my men was reproaching this personage bitterly for this unprovoked aggression.

The leader of the mountaineers raised his hand and, in low but emphatic tones, declared that if no rescue were attempted nor any disturbance made, no harm would befall us and in a few weeks we should be safely back among our people, adding, "I am Raisuli! the Raisuli!"—

A Waterwheel Driven by a Donkey on the Road to Tsarradan. Raisuli's Stronghold

Notice the earthen jars and the blindfolded animal

this, as I afterward discovered, being his clan appellation, since this chereef, or native nobleman, is known among his own followers as Mulai Ahmed ben Mohammed, the Raisuli.

On hearing him declare his name I felt at once that the affair was possibly more serious than I had hitherto anticipated, since the presence of this insurgent chieftain meant more than a mere summons to surrender any money or valuables in the house, and that some political object had probably dictated this attack—one which had been so unexpected and suddenly executed that neither our guards nor our grooms and gardeners, nor the Spanish workmen employed upon the estate, nor we ourselves had been able to make any defense, all of us having been simultaneously attacked and overpowered before we were aware of any impending danger.

Raisuli had indeed been reported to be on the warpath for some time past, but as his operations had been confined to outlying native villages or to the smaller towns, no one imagined he would attack any one in the immediate neighborhood

Encampment of Migratory Shoemakers Outside of Tangiers

These shoemakers live in the mountains and every year come down to camp for a month here while they make and repair the shoes of the people

of Tangier—where I myself, as president of an international commission that administered the affairs of the town, was in a position to requisition by telephone the entire available military force.

Approaching him, bound as I was and in evening dress, I said to him in Arabic, "I know you by name, Raisuli, and I accept your safe conduct, but we cannot go with you thus. We must have our overcoats, hats, and boots."

"Which of your servants shall I have released to return to the house for what you require?" replied Raisuli.

I selected Bourzin, the younger of the guards, on duty that evening. On indicating Bourzin, his bonds were cut and he was released; but as he did not immediately reappear, Raisuli became impatient; still he allowed another of my servants, a Spaniard, to also be released, and the latter quickly executed his commission. We had not time, however, to put on our boots before we were hurriedly made to mount.

Several of our horses had been brought up from the stables, but either because it was feared that Varley might escape or because he had been wounded, he was put upon a mule which the mountaineers had brought with them, while I was allowed to select which of my animals I would

Moorish Women at the Spinning-wheel Waited on by a Slave

ride. As I apprehended a long journey, I chose the youngest and most spirited of my horses.

Before we mounted our hands were freed, upon giving our parole that we would not endeavor to escape. This was an immense relief, for those palmetto bonds cut into the wrist, while the constrained position of our arms amounted to torture.

We were not, however, allowed to hold the bridle ourselves, but were led off by the mountaineers, whose rough handling threw my horse into such a frenzy that it was with difficulty that I could keep my seat.

Just as we were starting, Bourzin reappeared and volunteered to accompany me, to which Raisuli assented, and this attendant was also allowed a mount.

Two of the mountaineers clambered upon Varley's horse, a big chestnut, which was not saddled, while the saddle which had been hastily placed upon my horse was one that had been cast aside and the girths were rotten.

As I learned afterward, this selection was due to a mistaken attempt of one of my grooms to save our saddles. He did not realize that they were required for our own use, and when he had been ordered to produce the saddles, had thrown this one to the mountaineers, declaring that the good saddles were all under lock and key at the house—a mistaken zeal, which cost me, later on, a serious accident.

Photo by Underwood & Underwood, Copyrighted

Courtyard of a Moorish Residence in Fez Showing Decorated Doors

The decorations which resemble inlaying in appearance are painted on wood

THE EXPERIENCE OF THE LADIES

Thus we were led off along the dark avenue beneath the overhanging branches of the trees.

"At least," I thought to myself, "At least the ladies know nothing of this horrible misadventure!" since I pictured them as still awaiting in the drawing-room our return from the servants' hall, to explain the uproar and the screams of the women.

Very different, however, had been the alarming experience of the other members of the family during the few minutes which had elapsed between our leaving the drawing-room and our departure with the mountaineers. As we learned six weeks afterward, the ladies had presently followed us from the drawing-room, but when they reached the servants' hall we had already been driven out of doors.

As Mrs. Perdicaris endeavored to join us, one of the mountaineers, seizing her, threw her violently backward, down a half flight of stone steps onto the pavement, while Mrs. Varley was pitched on top of her.

The women servants, who alone had not been bound, assisted the ladies to rise, and one of the women rushed past the mountaineers to the telephone, and before these savages realized her intention she called up the central office at Tangier, telling them of the attack and of our capture. Before she could say more she was torn from the instrument by the angry natives.

At the same moment the screams of a pretty native servant struggling with the men, who were dragging her off, aroused my wife, who, despite the fact that she was seriously hurt from her fall, rushed to the woman's assistance and Ayesha's cowardly assailants, fearing Raisuli's displeasure, hastily retired, balked of their proposed prey.

Mrs. Perdicaris was then herself assisted to the front hall opening upon the portico or pergola, where she came upon Bourzin. Instead of bringing us our things, Bourzin stopped to reassure my wife, inventing a statement to the effect that I knew the leader of the band and had in the past rendered Raisuli a great service, and that we were now amicably coming to some arrangement, but should any disturbance be made, that all of us, both the family and the servants, might be killed.

As my wife listened she heard my voice from without as I addressed Raisuli and, noticing that I did not speak in tones either of excitement or alarm, she concluded that Bourzin was telling the truth; consequently she waited near the door for my return, and in the meantime Bourzin slipped away, unnoticed, to rejoin me.

THE MARCH BY NIGHT

Needless to say the ladies waited in vain for our return, and when at last they ventured out onto the pergola all was silent. We had disappeared.

As for ourselves we were led rapidly along the avenue leading away from the direction of the town, our horses being forced over the dry stone wall which encircles the property and driven along by many a blow from the rifles of our escort, as the men dragged the unwilling animals over rocks, through the underwood and brambles, and across the numerous water-courses, down toward the plain of Bubana to the west of the town.

How different the familiar locality, the scene of many an exciting steeple-chase or game of polo, looked as we now negotiated its water jumps and barriers in the darkness. Here and there we came unexpectedly to the steep cuttings of water-courses or to deep pools, which our captors made no attempt to turn nor to choose the easy places; but as the fellow who held my bridle would hesitate upon the verge of such descents, my horse, pressing forward to escape the blows from the rear, would either step upon the heels of the man in front or push him unexpectedly over the edge, when all three of us would come rattling down into the water, into which we splashed, stumbling over the big boulders, each such incident terminating in a sharp blow upon my horse's nose, administered by the angry native so soon as the latter recovered his footing.

Ultimately I was, however, grateful even for these unpleasant interludes, since I was thus kept from reflecting upon the ulterior anxieties implied by our capture, owing to the effort to keep my seat in the saddle.

After circling around the town at a distance of several miles, our party struck across the fields toward the east, making in the direction of the track leading to Tetuan. Here the going was easier and we had more time to consider our situation. Varley and I, however, were intentionally kept apart from each other.

Later on we found ourselves for a few moments within speaking distance, and my companion asked how I thought this business likely to end.

"From what I have heard of Raisuli's character," I replied, "I hope we may not

be ill-treated, for should it be deemed necessary to starve or torture us into signing for a heavy ransom, I believe we shall be left to these ruffians. So long as Raisuli himself is in view, I do not think we need apprehend any violence."

"I do not see him anywhere at present, do you?" inquired Varley.

The men who led our animals now warned us to be silent. It was therefore with a distinct sense of relief and satisfaction that, just as dawn broke and when a halt had been called on a hillside, we saw Raisuli himself emerging from the gloom.

As he rode up I recognized the horse on which he was mounted as one I had lately purchased for my wife. This horse had been admirably broken to the saddle, but so soon as he was left to his own devices he became a terror to the grooms.

What, then, was my surprise to see the horse kneel in order that Raisuli might dismount, and, after the latter had thrown the bridle carelessly over the horses's neck, the animal stood, never offering to move as Raisuli advanced toward me.

Hastily dismounting, I approached the chieftain, insisting that I should be allowed to communicate with my friends, explaining to Raisuli that I was an invalid and that unless I could procure the remedies I required he might at any moment have a dead prisoner instead of a live one on his hands.

Raisuli made no answer; he merely drew forth from beneath his mantle a carnet or book, from which he extracted a sheet of European note paper, an envelope, and a pencil, which he handed me, none of these being articles used by natives.

I at once wrote to my wife, and then asked if my letter could be sent to El Minzah, our town residence, whither I presumed that my wife would have gone after what had occurred at Aidonia on the preceding evening.

Raisuli asked me whether I could guarantee that his messenger would not be arrested at Tangier.

I answered, "Certainly! My people will realize that any such detention would injure me!"

Hereupon he called one of his followers and taking the man aside gave him his instructions.

From where I stood I could see that the messenger did not at all relish these orders. However, after further insistence, the man looked up to Raisuli with an expression of devotion, and, stooping, kissed his leader's mantle in token of submission.

I then bethought me also of writing to the young Wazani chereefs to come up and negotiate my release. To this second request Raisuli did not so easily accede. However, ultimately he produced further paper and envelopes, and the messenger, taking both my missives, mounted one of my mules and rode back to Tangier.

We were now furnished with turbans and Moorish haiks or mantles, as the party did not wish to have it seem that any strangers or Europeans were with them. As the sun rose above the hills these mantles and the turbans added to our discomfort, as the heat became more and more oppressive.

About one o'clock we were halted for stream ,and the two natives who preceded me, mounted on Varley's horse, allowed the animal to drink.

In vain I endeavored to prevent the man who was leading my gray from approaching the chestnut, as both horses were great fighters; but the thick-headed mountaineer, paying no attention to my admonitions, led my horse into the stream.

In a moment the two animals were upon each other, while the natives were falling about in the water, which was full of great boulders, in the midst of which, the two horses reared and bit and fought each other, while I kept my seat as best I could under these trying circumstances.

Luckily I did not fall and ultimately

both horses and their leaders were dragged out onto the further bank by the united forces of the entire party and we proceeded on our way.

About one o'clock we were halted for luncheon in a valley between the hills, where there was neither shade nor cool water to drink, and the only food produced consisted of a few very gritty dried figs, a little hard and pungent cheese made from the milk of goats, and a glutinous and limp, yet exceedingly tough, galette or cake, which is the only form of bread used by the poorest natives. The few mouthfuls I tried to swallow sickened me, so we were only too thankful to mount as soon as we could.

In vain I tried to learn where we were going. Raisuli had remained in the rear and the surly mountaineers would not answer our queries.

THE COUNTRY TRAVERSED

The ascent, whither our course now led, became steeper as we penetrated further among the hills, and about four o'clock I met with the accident I had so long apprehended.

As we came to the bank of a rapid torrent, that was confined between steep and slippery rocks, my gray took the water jump; but not so did the sullen native who held the bridle; consequently there was a crash and, my horse rearing to recover himself, the rotten girths parted, and away went both the saddle and rider, backward down the steep declivity. It seemed to me yards before I brought up on a ledge of rock with, as I for the moment apprehended, a broken back and dislocated thigh. Here I lay quivering with pain until Varley came up, and, a little later, Raisuli. I told him of how the man's stupidity had nearly cost me a broken limb.

Raisuli reproved the man in question, and this fellow was replaced by another guide or jailer. I was hoisted with difficulty upon the saddle, now fastened on by palmetto cords, and we proceeded upon our melancholy journey. I felt I could not long endure the pain due to my fall, since my leg was already swollen from the thigh to the instep, while I was also numb with the weariness of this protracted ride, which had already lasted throughout the entire night and the better part of the day.

Every hour the country grew wilder and the road more abrupt. We only passed within sight of one miserable village, clinging to the steep hillside, and here the women and children came out to hoot and jeer at us, evidently realizing the situation and rejoicing over our sorry plight. Nor could I learn how much longer this weary march might continue to tax my failing strength; yet all this was trifling compared with what was yet to come.

A little later we reached the crest of a hill, from which we looked down upon a wooded vale, beyond which rose a rock-crowned eminence. Pointing to these bristling crags, my attendants told me that beyond these heights lay the village which was the object of our journey.

It seemed to me, wearied as I was, that it was impossible that I could endure so many more hours of fatigue and pain; but there was no help for it, since short of this undiscoverable village there was, it seemed, neither food nor shelter to be obtained.

Descending into the wooded valley, we crossed a stream, and the party halted beneath the giant oaks which stretched their wide-reaching arms above our heads. Here we halted for an hour's rest before we began the steep ascent—a path which took us up through a narrow cleft or gorge at the back of a great mass of the cliff that apparently had slid forward during some cataclysm of nature, leaving this open breach. Passing behind the fallen mass of rock, we climbed the narrow gorge, so narrow that we had great difficulty to protect our knees as our horses

struggled up the steep. And this was the gateway, the portals, giving access to Raisuli's lair.

We had yet several hours before we could reach the village of Tsarradan, situated on the southern shoulder of this mountain called Nazul. As the evening light faded, the track, which led often along the outermost edge of these lofty heights, overhung such precipitous descents that a single false step of my horse, which was now trembling with fear, might have cost me my life.

It was not until near midnight that we reached the hamlet, and I was deposited in a miserable hut composed of two rooms. The thatch had in part been blown away, and when, a little later, it came on to rain we were in a deplorable plight, since the floor of beaten clay soon became a soft ooze.

Thus we passed the night, without beds or any convenience. Of sleep I knew nothing, since, between the pain from my fall and the annoyance caused by innumerable creeping pests, I did not close my eyes. Indeed, this expedition cost me sixty hours without sleep and almost without food.

Raisuli, becoming alarmed at the report of his men as to our condition, appeared at the door of our hut on the second day after our arrival and asked whether he might enter. I was only too glad to see him and, holding out my hand, I bade him welcome. He seemed greatly relieved at my tone and manner, expressed his regret at finding me in such a condition, and added that had he known that I was in such feeble health he would have endeavored to capture some one else!

RAISULI'S PROPOSALS

This was but indifferent consolation, after all I had suffered. Still, when Raisuli went on to say that we were to consider ourselves not as prisoners, but rather as hostages, I confess that I felt relieved.

"Your horses and the arms I have taken from your dependents," he continued, "will all be returned to you. I ask nothing from you!"

I did not, however, feel so pleased when he explained that prior to our release he would exact from those who had inflicted so many wrongs upon himself and his people the following conditions:

First. The withdrawal of the body of troops now operating against him at the foot of the hills.

Second. The removal of the pasha, or military governor, of Tangier from his post.

Third. The release of all the men of the three Kabyles, or hill tribes, under the leadership of Raisuli who were at the moment confined in the prisons of Tangier or elsewhere.

Fourth. The payment of an indemnity of seventy thousand dollars, to be recovered against the Oolad Abd-el-Saduk.

Fifth. That Raisuli should be made over-lord of the villages of Zeenats and of Breeje!

As Raisuli concluded, I felt like saying, "Why not ask to be proclaimed, out and out, Sultan of Morocco?" In fact it seemed to me that it was quite as likely that the Sultan, Abd El Aziz, would agree to renounce the throne in favor of Raisuli as to accede to such conditions as the latter proposed to demand before consenting to our release. I literally felt my heart sink as I was thus informed of the nature of these conditions. I did not then know, however, of the orders which, even at that very moment, had been issued here in Washington; thanks to which energetic action on the part of our government my release was subsequently secured.

But, to return to my talk with Raisuli. "The indemnity you ask from the Abd-el-Saduk family," I said, "will ruin them."

"Precisely," he replied. "They have inflicted worse than death upon me. It is precisely in order to be revenged upon them that I have carried you off."

THE HISTORY OF RAISULI

He then proceeded to recall the circumstances of his own capture by the then Pasha of Tangier, Abd-er-Rahman Abd-el-Saduk, an incident that all at Tangier knew of at the time, some nine years prior to my present misadventure.

Raisuli, then as now, had been up in arms against the government, owing to an attempt on the part of the Pasha of Tangier to force upon the tribes of Beni Emsauer, Ben Idder, and Beni Arose a creature favored by the Abd-el-Saduks, as kaid of their district, an appointment in contravention of the arrangement sanctioned by time and custom, whereby these Berber tribes were entitled to the nomination of candidates to these posts, from which candidates the Sultan's government selected the governors, or kaids, of the district.

Abd-er-Rahman having failed in his attempt to establish his creature as kaid over these three tribes, united under the leadership of Raisuli, sent to the latter proposing an amicable settlement of the points at issue.

The latter, trusting to Abd-er-Rahman's safe conduct, accepted the pasha's invitation, and while seated at the latter's table was seized, in violation of the governor's solemn assurance, bound, and sent to Mogador, where Raisuli was chained in a sitting posture to the wall and where he thus remained four long years, during which he was never able to stand during the day nor to lie down at night.

The object of this cruel punishment was to cause Raisuli's death, the cowardly pasha not daring to openly do away with his prisoner, whose release from this horrible suffering was due to a member of one of the foreign legations at Tangier. While on a special mission to the capital this official had informed the Sultan of the circumstances of the case.

Abd El Aziz immediately issued an order to release Raisuli from his chains, excepting the fetters or anklets which confined his feet. Subsequently, after five years' confinement, Raisuli was unconditionally restored to liberty.

His property, mostly in flocks and herds, had, however, been appropriated by his agents or partners.

Failing to obtain justice, Raisuli had called together some of his more faithful adherents and had raided the zereebas or farms of his faithless associates, two of whom had subsequently been killed in an attempt to surprise Raisuli, himself.

This incident had again placed Raisuli under the ban. Forces were sent down from the capital with orders to bring in Raisuli, dead or alive.

It was these circumstances that had led the latter to effect my own abduction in order to bring the pressure of a threatened intervention by one of the powers to bear upon the Sultan and thus enable Raisuli to demand a free pardon for himself as a condition of my own release and also the payment of a heavy indemnity in order to be thus revenged upon the treacherous pasha, the cause of all his troubles.

That the Moorish authorities were fully alive to the necessity for immediate action was shown by the arrival the very next morning of an emissary from Hadj Mohammed Torres, the Sultan's delegate minister of foreign affairs at Tangier.

Torres had entrusted these negotiations to a cousin of Raisuli himself, a certain Sid Hassan. In accordance with Raisuli's suggestion, I gave this agent a note to Minister Gummere, the American representative at Tangier, together with other letters to my family.

This opportunity, which Raisuli allowed me without any restriction, proved an inestimable blessing, and the knowledge that I could thus communicate at pleasure with family and friends relieved the situation of its worst feature. I had always had a peculiar horror of being carried off and held to ransom, a misfortune which is almost more maddening to

the family and friends of the victim of such outrages than to himself. Therefore I felt grateful to Providence that since such a misfortune had overtaken me, I had at least fallen into the power of the most kindly and gentle of brigands imaginable. Indeed, I had never conceived of such a situation as that in which I found myself.

HIS PERSONALITY

In so many respects the man interested and attracted me in spite of all my natural motives for dislike. Raisuli was at once so gracious and dignified, not to us only, but to his own wild adherents, who evidently idolized their chieftain, whose position among them seemed that of the head of a Highland clan in the olden times.

He could not bear to hear a child cry, while on several occasions I noticed his care even to avoid allowing the bees collected on his cup to drown, as I saw him lift them out with his spoon or finally empty the cup itself onto the grass. Then, too, he was so quick to see the humorous aspect of a situation, while his repartee was as immediate and to the point as though he had been born in County Galway itself. In fact I discovered to my consternation that I was beginning to like the man in spite of my natural resentment. I found myself unconsciously accepting his contention that he was not a mere brigand or cattle-lifter, but a patriot struggling to rescue his Berber followers from the tyranny of the corrupt chereefian officials. His charm of voice, the natural poise and dignity of his manner, his self-control under provocation, all betrayed a superior character. He is in fact a born leader and with a certain statesmanlike quality. He deplored the condition of his country, the feuds which separate the tribes, the many deeds of violence, and the blood so uselessly shed.

In fact, this strange experience while in camp with Raisuli at Tsarradan began to assume an aspect of unexpected and idyllic charm. The life of the natives; the little touches of more gentle human character; the tiny child who offered me fruit, which I at first declined, until I noticed the expression of disappointment and mortification upon the boy's face, and then the radiant and almost ridiculous satisfaction of the little fellow when I pretended to enjoy his half-ripe offering; the many attempts of the wild people about me to propitiate me; their curiosity as to our own manners and customs, as when one venerable inhabitant of the village led me gently aside to inquire why we walked so energetically up and down the village green. "For health's sake," was my reply. "Indeed?" said the old Mohammedan, "and may I ask how many such daily turns, up and down, it may require to keep a Christian in good health!"—all afforded matter of interest and reflection. And then when the first answer from our home reached us, and we learned that already cablegrams had been received from Washington announcing that the squadrons under Rear Admirals F. E. Chadwick and Jewell, then coaling at the Canaries, had been ordered to Tangier to secure our release—and, above all, when I read the telegrams from the United States showing the wide interest so generously taken in our misadventure—when we realized all this, words cannot describe the emotion called forth by these evidences of interest and good will.

The next great excitement was the arrival, about a week later, of the relief expedition headed by the two young chereefs, Mulai Ali and Mulai Ahmed, sons of the late grand chereef of Wazan and of his English wife. Their approach was heralded by discharges of musketry, fired, as Raisuli informed me, by the inhabitants of the various villages on the route, a different route to the one by which we had been conducted. These discharges were to give Raisuli notice that strangers were entering the district, for "not only are you the only foreign-

ers," said the chieftain, "who have set foot among these Beni Arose people, but we do not even allow natives from other localities access, unless in some especial case like the arrival of these friends of yours, and," he added with a grim smile, "who are also distant relatives of my own!"

When at last the long line of men, mounted and on foot, with its train of baggage animals, appeared we were not a little gladdened by the sight.

Mulai Ali, the elder brother, pitched his camp near at hand, and after a long conference with Raisuli, the younger of the Wazani chereefs returned to Tangier to communicate to our own officials the state of affairs.

Not only had our friends sent us a handsome tent, with furniture and supplies of every description, but also a cook and servants to wait upon us, so that we suffered henceforth no undue hardships of any sort, while the presence of Mulai Ali, who speaks both English and French, was a most welcome addition, although our intercourse with "The Boss," as Varley and Mulai Ali dubbed Raisuli, diminished materially.

Another event also tended to augment my anxiety, which was the arrival of two very evil-looking emissaries from Bou Hamara, the pretender to the throne, and who wrote urgently, insisting that Raisuli should entrust us to his, Bou Hamara's, care. I had so suffered from my tiresome ride to Tsarradan that I felt I would far rather be shot where I was than be dragged off to die upon the road to Taza, situated in the very heart of these cruel mountains.

Raisuli explained that the Pretender wished to secure our persons to use as a shield in case he himself should be too hard pushed by the Sultan's troops.

HELP FROM MY COUNTRY

While standing near Raisuli one day on the village green, of which we were now allowed the freedom, one of his followers came up from Tangier, almost breathless from his haste, to report the arrival of the two American squadrons. The man described how the eight frigates had entered the bay, one after another. He told of the anxious deliberations of the Moorish authorities and of the alarm of the native inhabitants, who feared the town might be bombarded. The man declared that the place was *mkloub,* or upside down.

I watched Raisuli with anxiety, lest apprehending the landing of marines, with a view to our relief and his own capture, he might endeavor to drag us to some more distant and inaccessible retreat. What was then my surprise when looking up with a bright smile, he said, "Well, I think I can now congratulate you!"

"I do not understand you," I replied.

"I mean," answered Raisuli, "that the presence of these vessels will lead the authorities at Tangier to make such representations to the Sultan as may result in his acceding to my demands, and then you will be able to return to your friends."

This calculation of the insurgent leader was soon proved to have been justified, since a runner carrying a dispatch, one of four copies of the same document, each carried by a separate courier, was held up by some of Raisuli's partisans, and thus we learned the, to us, grateful information, which was confirmed by the arrival of Sid Hassan a few days later to say that His Chereefian Majesty had been most graciously pleased to accede to the demands which Hadj Mohammed had forwarded to Fez.

THE DISPOSAL OF THE RANSOM MONEY

Raisuli was now confronted by the problem as to what disposition he was to make of the seventy thousand silver Spanish dollars which he demanded for our release. Here at Tsarradan there were no iron safes, nor so much as a house with a cellar, while the thatch of

skaff, or dried reeds, the only roofing of the houses, offered but poor security should he leave so much coin stored in a village where he himself was but a transient sojourner.

To the great amusement of Mulai Ali, and to my own considerable astonishment, the solution of this troublesome question which Raisuli proposed was that "La Senora," as the natives called my wife, should receive the seventy thousand dollars from Torres and deposit the money to her own credit in Tangier at the bank where we were accustomed to cash our checks, and that he, Raisuli, might then draw upon Mrs. Perdicaris as occasion should require.

I, however, entirely declined to request my wife to accede to this singular proposal, and when I explained to Raisuli the suspicions to which such an arrangement might expose us, he at once said that he would be the last to wish to place us in such a position.

It was finally arranged that the younger of our Wazani friends should bring to a certain village half way between Tangier and Tsarradan twenty thousand dollars in silver and the remaining fifty thousand in certified checks on the Comptoir d'Escompte, the French bank at Tangier, together with the prisoners whose release Raisuli had demanded, and that our captor should accompany us to this village, of which the Sheik, El Zellal, was one of his adherents. These negotiations occupied some time and led to many journeys of Sid Hassan back and forth from Tangier to Tsarradan.

After six weeks, and on the evening preceding our departure, we strolled from the village green with Mulai Ali; nor were we now, as had always hitherto been the case, accompanied by any of Raisuli's men. During our walk we fell into conversation with a native from another village, and who made some allusion to two unfortunate Spanish children, for the boy at least was but a child, though his sister was fifteen. This brother and sister, the children of a poor charcoal-burner, had been stolen about two years prior to our own adventure, nor had they been recovered, despite the pressure exerted by the Spanish authorities at Tangier.

We now learned to our horror that these unfortunate children had been carried off by the very man in whose hut we had spent so many sad hours, and that they had not only occupied the very room where I slept, but that after a long detention they had been ultimately killed in the garden and were buried not far from where our horses were tethered. This discovery showed the lawless character of these Berber followers of Raisuli, and also that we ourselves had been in more danger than we realized, had any mishap to Raisuli occurred while we were among these savages, for such these Berbers really are, possessing neither a written language nor any of those elements of culture or refinement which almost every other white race boasts.

I confess that during this our last night in that wretched hut, the scene of the sufferings and humiliations of those unfortunate Spanish captives, I scarcely closed my eyes.

OUR RETURN

The next morning it was still dark when our men began loading the pack-mules, and we reached the crest of the mountain, which lay between us and Tangier, just as the sun rose. Never have I anywhere witnessed a scene of more wild and fantastic charm. A slight mist hung about the base of the rocks, whose peaks and turrets were now flecked with crimson or lilac, now shaded with purple, by some passing cloud.

On our left rode Mulai Ali, arrayed in a silk bournous of spotless white, followed by all his men, while on my right Raisuli bestrode his gray charger. The dark, thick cords of twisted camel's hair crossed about his white turban, and the

cartridge belt over his broad chest made him look every inch a man of daring deeds.

Upon this occasion Varley and I rode our own horses, or, rather, I rode the black horse which Raisuli had ridden on our way from Tangier, and as we climbed again, but in how different a mood, those rocky steeps I told the latter of my surprise at the horse's behavior. A smile played upon the chieftain's lips as he answered, "Oh! that is easily explained! Did you not know that before you purchased that horse it belonged to me?"

"I did not, nor," I added, "do I seem to have known as much of your affairs as you evidently knew of mine! Still," I continued, "this does not entirely explain the very different behavior of the horse. I can understand that you could, by the use of spur and bridle, compel the horse to kneel in order that you might dismount, but I am still at a loss to account for his standing obedient and motionless when you had left him to his own devices!"

"This is also easily explained," said Raisuli. "The fact is," he continued, "you Roumi are of too easy a disposition. You spoil your wives, your children, your servants, and even your very horses. These animals," he said, "are quite intelligent enough to know that they must obey *our* wishes, even when we are not in the saddle!"

"If these are your views of how we should deal with men, women, and even with animals, I will mention the fact to the Sultan when I next see him," I replied jocosely.

"Yes," continued Raisuli, in the same strain, "and if His Chereefian Majesty indulged in fewer European fads, and had a little more grip, and would use the spur more freely, *he* would have a better seat in *his* saddle," referring to the expression that the throne of the Sultan should be his saddle.

We continued during the entire morning in a northerly direction. Our path after taking us over the lofty crest of Mount Nazul and through the forest of almost primeval oaks beyond, again led us along the crest of a line of hills—a path at times so narrow that we were compelled to proceed in single file. At such moments our escort trailed out over half a mile or more, passing between steep slopes or even abrupt precipices on either side of us. From these heights we could see the distant sea and the Spanish coast beyond, and at last Raisuli pointed out to me a white fleck upon the distant sands of the nearer African coast which he said was Tangier.

About noon we found ourselves looking down upon a village many hundred feet immediately beneath us. Here a halt was called. This was the eyrie of El Zellal, a semi-fortified place, hanging on to the steep hillside, half village, half Zereeba.

Raisuli sent forward some of his followers on foot to be sure that no government troops were hiding within the village, the approach to which was through a tall gateway of masonry, and when his men reappeared, signaling that no foes were concealed within, the chieftan turning to me said, "Do as you see me do!" As he spoke he spurred his steed violently; whereupon the animal, squatting upon his haunches after the manner of a dog rather than that of a horse, slid down the steep descent.

Congratulating myself that my own horse, having been trained by Raisuli, probably possessed the same accomplishment, I followed suit, as did the other mounted members of the party, and presently we all found ourselves gaily tobogganing down the steep hillside and through the gate right into the village, where we had some difficulty in pulling up at the entrance of the residence of El Zellal himself, so abrupt was the incline or downward grade.

Here we were detained, owing to the absence of Mulai Ahmed, the younger Wazani chereef, who did not arrive at the appointed hour with the ransom and Raisuli's men who had been released

from prison—a delay due in part to the difficulty of bringing with him, in addition to other impedimenta, a huge mule litter to carry me, should I not be able to endure so many hours in the saddle.

In the meantime we waited amid a solemn silence, except when some much-required food was served, and as we sat there it might have seemed more as though we were in some house of mourning rather than in one so shortly to become the scene of our eagerly desired liberation.

THE ARRIVAL OF THE RANSOM

At last the mules bearing the silver dollars, carefully packed in boxes, arrived; but now luncheon was again served in honor of Mulai Ahmed, and must be partaken of, after which the bullion was counted in another room.

Here I was presently summoned, and invited to seat myself between Raisuli and Mulai Ahmed, while a group of the more important natives, including El Zellal, as well as men from other localities, were ranged around the room.

"The silver," said Raisuli, addressing me, "has been counted—twenty thousand dollars, as stipulated, in Spanish dollars; but these letters," showing me as he spoke a check book containing certified checks on the Comptoir d'Escompte, the French bank at Tangier, "of the value of these, which are supposed to represent fifty thousand dollars, I know nothing. However, I will accept them on your personal guarantee, but on that condition only."

When I had examined the checks certified by Torres and by El Gannam, the Sultan's delegate minister of finance, I gave the required assurance verbally, and Raisuli, leading me to the door, where I found my horse waiting for me, bade me adieu, saying that he had learned to look upon me as a friend, and that he hoped I cherished no ill feeling on account of my detention. He furthermore assured me that should any danger menace me in the future, that not only he himself, but any of the men of the three tribes under his orders, would hasten to my relief.

Thus I left him, and pushing on as rapidly as we could we were soon in the midst of the large armed escort which had come from Tangier to see us safely home. It seems there had been some rumor of an intention on the part of other tribes to secure our persons after we should have left Raisuli and to hold us for further ransom.

Fortunately our further journey suffered no delay other than that caused by the transport of the litter, of which I was most thankful to avail myself, since I had twice suffered while at Tsarradan from severe nervous prostration.

This reminds me to mention with a grateful heart that my wife having applied to Admiral Chadwick, when she learned of my second attack, to inquire whether a surgeon could be detached from one of the vessels under his command, every medical officer in the fleet at once volunteered to go and attend me, even though warned that they might be themselves detained by Raisuli.

We did not reach Tangier until long after dark. As we were pushing forward in the gloom of evening a company of native cavalry, which had been sent out to report our arrival, galloped up, and so soon as they discovered we were of the party, turned and hastened back to announce our coming, as to which there was even yet grave anxiety. An hour later and we could see the town lights, and also those on the mastheads of the vessels in the bay, and we could even make out that these were answering signals from the United States consulate in the town. Yes, our friends now at last knew that we were near at hand.

I struggled out of my litter and onto my horse and presently galloped through the gateway of my home, amid the acclamations of friends and neighbors. As I descended from my horse Admiral Chadwick himself, who had with Minister Gummere awaited my arrival even until this late hour, for it was now nearly

midnight, grasped me by the arm, and thus was I literally restored to my family by the gallant officer in command of the fleet which the United States government had so generously sent to my rescue. But for this strenuous and successful intervention I might still be detained among those mountains. Upon this point I insist the more, since it has been suggested that we owed our rescue to other agencies.

To the joint exertions of my friends, Minister Gummere, and to the British Minister, Sir Arthur Nicolson, I am deeply indebted—indeed, I can find no words adequate to describe what I owe to them, as well as to Admiral Chadwick, not merely for their untiring efforts on behalf of Varley and myself, but for the sympathy and solicitude of which my wife was the recipient throughout these long six weeks, so much more trying to her even than to ourselves, since she indeed was the greater sufferer.

With this expression of my gratitude to the government and to the people of the United States, I conclude this account and beg to thank you also for the indulgent patience with which you have listened to so long a narrative.

NOTES ON MOROCCO

MOROCCO in the early days of the Christian era was one of the granaries of the Roman Empire. Her lands today are no less rich; but, owing to the lawlessness of a weak government and a strict prohibition of the exportation of grain and cattle, they are now for the most part abandoned and have been untilled for many centuries. Morocco contains about 250,000 square miles, one-half of which, or an area almost equal to that of North and South Dakota combined, is covered to a depth of six to nine feet with a black loam which rivals in fertility the soil of our prairie states. Her location makes her too valuable to leave undeveloped. Morocco at present exports annually only $5,000,000 worth of beans, skins, hides, fruits, olive oil, and wood. Her imports amount to about $6,000,000 worth of cotton goods, sugar, tea, and hardware. The country is rich in the deposits of copper, iron ore, antimony, and rock-salt, and gold and silver are reported.

The country is generally mountainous, the Atlas range, which attains an elevation of nearly 15,000 feet, traversing it in several parallel chains from southwest to northwest and sending out numerous cross spurs. The climate in many sections is delightful and very healthful.

In no country in the world probably does woman have such a low status as in Morocco. The usual practice of the Mohammedan of Morocco is to divorce his wife after he has lived with her six or seven years, even though she may have borne him children. He then takes a younger and more comely partner, while his former wife must be satisfied with any husband she can get. After several years with her second husband, she is once more discarded, and marries again; and so the process goes on, each marriage being lower in scale, until she dies in poverty and wretchedness of the meanest description.

GOOD BOOKS ON MOROCCO

"The Land of the Moors": A comprehensive geographical description. Budgett Meakin. Macmillan Co. Illustrated. $5.00.

"The Moorish Empire": A historical epitome. Budgett Meakin. Macmillan Co. Illustrated. $5.00.

"The Moors." Budgett Meakin. Macmillan Co. Illustrated. $5.00.

"Morocco As It Is." Stephen Bonsal. Harpers. $2.00.

"A Ride in Morocco": Travel on the "beaten highway," with interesting incidental experiences of the author. Frances MacNab. Longmans, Green & Co. $5.00.

"Things Seen in Morocco": Being a bundle of jottings, notes, impressions, and tales. A. T. Dawson. Funk and Wagnalls. $2.50.

"In the Tail of the Peacock." Isabel Savory. James Post. New York. $3.50.

"Into Morocco." Burton Holmes. With many illustrations from photographs by the author. The volume is one of the series of Burton Holmes' Lectures and is not sold separately. McClure, Phillips & Co.

OUR HETEROGENEOUS SYSTEM OF WEIGHTS AND MEASURES

AN EXPLANATION OF THE REASONS WHY THE UNITED STATES SHOULD ABANDON ITS OBSOLETE SYSTEM OF INCHES, TONS, AND GALLONS

By Alexander Graham Bell

The following pages contain an informal address to the Committee on Coinage, Weights, and Measures of the U. S. House of Representatives on February 16. The bill under consideration reads as follows:

Be it enacted by the Senate and Hou e of Representatives of the United States of America in Congress assembled, That from and after the first of July, nineteen hundred and eight, all of the Departments of the Government of the United States, in the transaction of business requiring the use of weight and measurement, shall employ and use the weights and measures of the metric system.

The bill was introduced in the House of Representatives by L. N. Littauer, Representative from New York, and is known as "the Littauer Bill.". Dr Bell's address is published here through the courtesy of the chairman of the committee, James H. Southard, of Ohio.

THIS is one of the briefest bills I have even seen — only five lines—but it is pregnant with consequences to the people of the United States. It means very much more than appears upon its face. This is a mandatory bill requiring the use of the metric system in the departments of the government, but of course Congress would not pass a bill of this kind unless as a step toward the introduction of the metric system generally in the United States. So that this really means, if you pass it, that you have decided to abolish the chaotic systems of weights and measures we now have and substitute the metric system not simply for the government departments, but for the whole of the United States. This bill is simply a logical step in the consummation of the greater plan, and I hope it will pass.

It is obvious that our present system of weights and measures is in a very chaotic condition. It certainly is not right that a coal company should be able to pay their miners by a ton of 2,240 pounds and then sell their coal by another ton of 2,000 pounds. But even the pound itself varies in weight according to circumstances. Some of our people employ a pound of 16 ounces, others a pound of 12 ounces; so that it is necessary in business transactions to have a definite understanding as to the kind of pound we employ—whether avoirdupois or troy weight. The ounce, too, varies. Our apothecaries use an ounce of 8 drams, whereas there are 16 drams in an ounce avoirdupois. Thus the avoirdupois pound consists of 16 ounces of 16 drams each, equivalent to 256 drams, whereas the pound used by our apothecaries contains only 12 ounces of 8 drams each, equivalent to 96 drams.

In a similar manner we have different kinds of bushels and gallons and other measures in common use by different sections of our people; and if there is anything that is clear it seems to be this—

that we need uniformity in our system of weights and measures.

Of course, it matters little what system may be employed by an individual, so far as he himself is concerned; but the moment he has dealings with other individuals the necessity for uniformity and a common understanding arises. The right of the individual to choose his own methods of measurement must give way to the convenience of the community of which he forms a part; in a similar manner the right of sections of the community like apothecaries, silversmiths, etc., to have their own peculiar system of measurement should give way to the right of the community as a whole to have uniformity and a system convenient to all.

Every state in the Union might with perfect propriety have a different system of weights and measures if there were no interstate transactions or mingling of people from different parts of the country, but the interests of the nation as a whole demand uniformity throughout the length and breadth of the land.

In achieving such a result the United States might very well establish a peculiar system of its own, without reference to the usages of other countries, if we formed an isolated people, having no dealings with the rest of the world; but in making a change—and the necessity for a change is very obvious—it would be advisable to adopt a system that would not only be convenient for our own people, but would also be convenient for the other peoples of the world with whom we carry on trade and commerce.

No one doubts that the metrical system is superior to the crude methods of measurement we employ. It is therefore useless to expect that foreign countries employing the metrical system will ever change to our methods of measurement; from which it follows that if international uniformity is to be secured it is we who must give way. We must either adopt the metrical system or some other system—not our own—which may have some chance of international adoption.

At the present time, however, the metrical system is the only system known that has the ghost of a chance of being adopted universally by the world. As a matter of fact, it is now international in character, for practically all of the civilized nations of the world have already adopted it with the exception of the English-speaking peoples, who employ an admittedly inferior system.

The metrical system was legalized in the United States in 1866 and is already in use by a portion of our people, thus adding to the existing confusion. Our scientific men especially employ it, almost universally, and merchants having dealings with foreign countries are obliged to use it to a greater or less extent. Our imports from non-English-speaking countries are largely expressed in metrical measures, and in exporting to these countries our merchants must adopt the metrical system or be placed at a disadvantage with competitors who already employ it; for people accustomed to the metrical system will not take the trouble of translating our measures into their own system in order to understand what they are buying, if they can obtain the same goods elsewhere expressed in the measures with which they are already familiar. There can be no question that in competing with metrical countries for the trade of the countries already employing the system, our commerce is seriously handicapped by the inconvenient and antiquated systems of weights and measures in use in the United States. This means that we are at a disadvantage everywhere in the world excepting in dealing with Great Britain and her colonies.

A WASTE OF LABOR

Few people have any adequate conception of the amount of unnecessary labor involved in the use of our present weights and measures. Scientific men and merchants may have the necessary skill with figures to enable them to use the metrical system, but how about the common people of the country? It is just here that

the metrical system possesses special advantages—reducing to a minimum the amount of labor and skill required in the solution of the every-day problems of life involving the use of figures.

The people of Great Britain, having no practical experience by actual use of the advantages of a decimal system of measurement, may have difficulty in realizing the amount of unnecessary drudgery through which they are obliged to go in order to obtain a solution of the simplest arithmetical problems, and they therefore have some excuse for remaining in the rear of progress; but the United States has no such excuse to offer for her hesitation in joining the majority of the civilized nations of the world in the adoption of the metrical system. We already have a decimal system of money, and our people are therefore prepared to appreciate the great saving of labor involved in pushing the decimal principle into all our methods of measurement. We would not, if we could, go back to the old pounds, shillings, and pence of our ancestors, for we can realize through our every-day experience with dollars and cents the drudgery we are saved in all financial calculations, and are therefore prepared to appreciate, by analogy, that corresponding benefits would arise from our adoption of a decimal system in our weights and measures.

Let us compare for a moment the arithmetical processes involved in calculating by the old method of pounds, shillings, and pence with the simpler process employed when we deal with dollars and cents and then apply the results to the metric system of weights and measures. Take any problem that may occur to your mind. Let us take, for example, the figures 1906, which express the present year. Now if we had 1906 pennies and wanted to find out how many pounds, shillings, and pence this amounted to, we must divide 1906 by 12 to find the number of shillings, and then divide the product by 20 to ascertain the number of pounds; but the moment you adopt a decimal system of money like our own this kind of drudgery becomes entirely unnecessary. No calculation whatever is required in order to reduce the figures from one denomination to another—we simply shift the decimal point. We know at once, without calculation, that 1906 cents amount to 19.06 dollars.

In a similar manner, in using the metric system we know without calculation that 1906 centimeters amount to 19.06 meters, and that 1906 grams amount to 1.906 kilograms. No calculation is involved.

Now compare this simple process with the laborious processes involved in the use of the ordinary measures of length and weight. Take 1906 inches—how many feet and yards? We must divide 1906 by 12 to find out the number of feet, and then divide the product by 3 to ascertain the number of yards. Or take 1906 ounces—how many pounds?

*Mr Chairman:** What kind of ounces?

WE HAVE THREE KINDS OF POUND

Mr Bell: Yes—what kind of ounce, for we have more than one. And what kind of pound—avoirdupois weight, troy weight, or apothecary's weight? In one case we may have to divide 1906 by 16, in another by 12; but the point I wish to make is this: that a calculation of some sort is involved in the mere process of translation from one denomination to another in the same kind of measure, while by the metrical system all this kind of labor is saved—we merely shift the decimal point.

The amount of labor saved in calculating square measure and cubical measure is still more remarkable. Try square measure first. Take the figures 1, 2, 3, 4, 5, 6: 123,456 square inches, how many square feet? I will not try to work it out, but you must divide this number by 144 to get the number of square feet.

*James H. Southard, Representative from Ohio.

You will probably require paper and pencil to perform the computation; but on the metrical plan the solution is so easy that any intelligent person can arrive at the result mentally without any calculation whatever. 123,456 square centimeters is equivalent to 12.3456 square meters.

Even should we forget that there are 10,000 square centimeters in a square meter, a moment's thought will enable us to recover the knowledge. The merest tyro knows that a meter consists of 100 centimeters (the name "centimeter" itself meaning "one-hundredth of a meter"), so that a square meter is a surface measuring 100 centimeters one way by 100 centimeters the other. 100 times 100 is 10,000, the figure 1 followed by four ciphers, which means that we must shift the decimal point four places to the left to ascertain the number of square meters.

HOW MUCH WATER IN THE RESERVOIR

Now try cubical measure; take any problem that comes to the mind. Suppose we have a rectangular tank or reservoir of a certain length, width, and depth—how much water will it hold, and how much will the water weigh?

We begin of course by multiplying together the length, width, and depth to ascertain the cubical contents. This kind of calculation must be performed, whatever the system of measurement employed, and I shall simply say that the computation is much simpler on the metrical plan than on the other because no non-decimal fractions are involved. If the length, breadth, and depth be expressed by an exact number of feet, the labor involved in this portion of the calculation will be the same in both cases; but as a general rule in such computations one or more of the dimensions will not be exact in feet, but may be four feet "and a half," or 3 feet "4 inches," etc., and we then find it advisable to reduce the whole to the lowest denomination used—say cubic inches. In such a case the metrical system has greatly the advantage. But after the whole computation is over and we have ascertained the cubical contents in the lowest denominations employed, the problem is solved if the metrical system is used, whereas much labor is required on the present system to put the answer into final shape.

A LABOR-SAVING DEVICE

We shall take a specific case, and in order to show the ease with which the problem can be mentally solved on the metric system with the very largest figures, we will take a sum involving nine figures, thus running up into the millions. Having measured our tank or reservoir and performed our initial calculation, suppose we find that the tank contains 123,456,789 cubic inches of water.

How many gallons have we there? And how much does the water weigh?

I will not attempt to work the result out to its final conclusion even with the aid of paper and pencil, for I must confess that my memory does not hold the exact number of cubic inches contained in a gallon and I have no means of recovering this knowledge excepting by reference to a printed table. Then again my memory does not retain a distinct impression of the relation of weight to volume of water on our present system. The problem is therefore absolutely insoluble to me at the present moment. I must consult some reference book for the information that would enable me to work it out. But put the problem in metrical terms and the problem is solved as soon as you have ascertained the cubical contents in any of the metrical denominations you prefer; the translation of the result into other more convenient denominations of the metrical system requires no calculation and is a mere question of putting the decimal point in the proper place.

For example, suppose we find that our tank hold 123,456,789 cubic centimeters of water. How many liters have we

there, and how much does the water weigh? The answer is 123,456.789 liters, weighing 123,456.789 kilograms.

Now, supposing we forget for the moment that one liter of water contains one thousand cubic centimeters and weighs one kilogram, it is not necessary for us to consult a work of reference. A moment's consideration of the elementary propositions of the metric system will enable us to recover the knowledge for ourselves by mere mental computation. We cannot forget that one cubic centimeter of water weighs one gram, for that fact lies at the root of the relation of weight to volume in the metrical system. We cannot forget the equally elementary proposition that a cube having a side of 10 centimeters has a volume of one liter, for this lies at the root of the relation of length to volume on the metrical system. If we do not know these facts, we do not know the metrical system at all.

A cube having a side of 10 centimeters has a volume of one liter; then how many cubic centimeters are there in a liter? Picture to yourself a cube of the required dimensions and mentally calculate the cubical contents. It is 10 centimeters long, 10 centimeters wide, and 10 centimeters deep. Multiply these dimensions together; 10 times 10 is 100, and 10 times 100 is 1,000. Here we recover the forgotten fact that a liter contains 1,000 cubic centimeters. But one cubic centimeter of water weighs one gram; from which it follows that 1,000 cubic centimeters (one liter) weigh 1,000 grams (one kilogram). 1,000 is the figure 1 followed by 3 ciphers; and this fact directs us to shift the decimal point 3 places to the left in order to convert cubic centimeters of water into liters of volume or kilograms of weight.

Contrast the amount of labor involved in this simple process with that involved in ascertaining from the number of cubic inches of water the volume of water in gallons and its weight in pounds. Nothing, I think, can better illustrate the fact that the metric system is a labor-saving device of the greatest importance and value.

It is safe to say that after the metric system has been adopted by the United States and our people have become accustomed to its use we would no more dream of going back to the present system of weights and measures than we would think of carrying on the processes of arithmetic through the medium of the old Roman letters in place of the Arabic numerals we now employ.

THE EXPERIENCE OF DR BELL'S LABORATORY

The laborious nature of the calculations involved in the use of our ordinary measures was forced upon my attention a number of years ago by the fact that I commenced to carry on in my laboratory a series of experiments with man-lifting kites—enormous structures, which had to be made very light in proportion to their supporting surfaces in order to carry a man up into the air. These kites cost several hundred dollars apiece to construct; and it was therefore found advisable, after repeated failures, to calculate beforehand what the weight of a proposed structure would be; and then calculate, from the total amount of silk employed and from the angle which the oblique surfaces made with the horizon, the amount of effective surface upon which the wind would act (the projection of the oblique surfaces on a horizontal plane). From these figures the ratio of weight to support surface for the whole structure was ascertained and the fact determined whether the proposed kite would fly in a moderate wind—before actually commencing its construction. The calculations proved to be so laborious that I found it simpler to translate the proposed measurements into metrical terms and then work out the solution on the metrical plan.

The translation of the ordinary measurements into metrical terms, and *vice*

versa, involved considerable labor on my part, and it seemed advisable therefore to introduce the metric system into the laboratory and have all measurements made directly in metrical terms. The only question in my mind was whether ordinary workmen, carpenters and mechanics accustomed to the usual methods of measurements, could or would employ the metric system.

The result may be of interest to the committee as bearing upon the question of the ability of the common people of America to handle a new system of this kind. No difficulty whatever was experienced in the use of the system, and the total expense involved in the change amounted to a few dollars for the purchase of a set of metrical weights and measures. The same balances formerly employed were equally efficient in weighing by the metrical system, and even the old weights were utilized as supplementary weights, with their value in grams distinctly marked upon them. No change was required in the machinery and tools employed, simply a change in the method of measuring the output.

For convenience of reference a chart of the metrical system was hung up in the workshop, but no effort was made to have the men master the new names involved, excepting so far as they were introduced by actual use. The names of which the men were most afraid, like dekagram, hectogram, dekameter, and hectometer, were really not required at all in actual use. The only terms employed at first were meter, centimeter, and gram; but the necessities of the laboratory soon introduced millimeter, kilogram, and liter. In this connection it is rather interesting to note that the word "decimeter," although understood, remained among the unused terms, the men preferring the expression "10 centimeters," just as we usually prefer to call a dime "10 cents" rather than a dime. So, too, a cubic decimeter (or liter) was preferably called "a cube of 10 centimeters."

So long as I did not ask my men to translate from one system into the other, all was plain sailing. They would have difficulty in translating from pounds and ounces into grams or kilograms, or from feet and inches into centimeters or meters; but in the actual measurement of length with a metric measure in hand, and in actual weighing with metrical weights, no difficulty whatever has been experienced.

The use of the metric system in my laboratory has greatly facilitated all calculations and the men like it.

WE ARE ONE OF THE LAST NATIONS TO ADOPT THE METRIC SYSTEM

The Chairman: It has been contended by one or two people at least who have set out to oppose the introduction of this system that in France and in Germany, where it has been used as long as anywhere, it is not really the system of weights and measures of those countries. You have been there?

Mr Bell: I have been in France; and so far as my observation has gone it seems to be in universal use there. I understand that it is also employed in Germany. In fact we are one of the last nations to take it up. I understand that nearly all the civilized nations of the world have already adopted the metric system, with the exception of Great Britain, the United States, and the British colonies.

The Chairman: Of course we realize that an argument can be made about the confusion which exists in weights and measures in this country in a great many different lines. For instance, in the United States Mint they have four standards of weights—apothecary's, avoirdupois, troy, and the metric measures.

Mr Bell: I do not think any system of weights and measures has any chance of becoming universal except the metric system, and its growth during the short time it has been in existence seems to indicate that it has such a chance.

THE REASON WE DID NOT ADOPT THE METRIC SYSTEM WHEN WE ADOPTED DOLLARS AND CENTS

It has always been a matter of wonder to me why the United States, when it changed from the old system of pounds, shillings, and pence to the present dollars and cents, did not at the same time go the whole way and adopt the metric system of weights and measures. The answer, however, is simple. The metric system had not then been invented, or rather had not anywhere come into use. Propositions foreshadowing its advent were under consideration, but the metric system as we know it did not appear until after the passage of our coinage act of 1792. It was only adopted by France about the beginning of the nineteenth century, and if I remember rightly—and if not Mr. Stratton will correct me—the first standard kilogram and the first standard meter were not deposited until 1830.

*Mr Stratton:** It was just about the time that we made the change in coinage that they were considering this system. Congress directed John Quincy Adams, the Secretary of State, to make an investigation in regard to the matter, and he did so, and he made a report in which he called attention to the fact that the metric system was then being developed; and he advised us to watch it closely, and he said that it was in his opinion a thing we ought to adopt if it proved successful.

Mr Bell: In 1790 Jefferson advised a decimal system of weights and measures and suggested the length of a second pendulum as a unit.

The Chairman: Of course he could not recommend the metric system because it had not been invented.

Mr Bell: No; it was not introduced until later. Some action was taken by France in 1795, and in 1798 it was considered by some international gathering, but it was not legalized in France until 1801, and many years elapsed before legal standards were prepared.

* S. W. Stratton, Director of Bureau of Standards.

OUR WHOLE SYSTEM OF ARITHMETIC IS DECIMAL

There is one other point to which I desire to call attention, which seems to me to lie at the root of any proposed change in our methods of measurement in the direction of simplicity and ease of application, and it is this: We employ a decimal system of arithmetic; from which it follows that a decimal system of measurement will be more easy for us to handle than any system in which the units of measurement do not progress by tens.

Our whole system of arithmetic itself is decimal in character. In counting we employ 10 figures: 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9. We then repeat these in groups of 10, advancing from 10 to 20, 30, 40, etc., up to 99. We then advance by groups of 10 times 10, namely, 100, 200, 300, etc., to 999; then by groups of 10 times 100, namely, 1,000, 2,000, 3,000, etc., etc.

From this peculiarity in our method of numeration it follows that any system in which the units of measurement advance by tens is specially suited to our system of arithmetic. It enables us to change from one denomination to another in the system, as desired, without special calculation, by simply changing the place of the decimal point. Now the metric system is a decimal system of this character. It has already found favor with the world at large, and I think America should adopt it and make it her own. It really is astonishing, when you come to work out complicated problems involving cubical measure, specific gravity, and the relation of volume to weight, how much labor of calculation is saved by the use of the metrical measures.

The Chairman: If you will point out what that relation is specifically, perhaps it would be interesting. The members of the committee may understand, but I would like to see it.

Mr Bell: There is a simple relation between volume and weight: one cubic centimeter of water weighs one gram. That fact remembered is the key to the whole subject.

Now if you want to calculate the weight of any other substance you have simply to express its volume in cubic centimeters and multiply that by the specific gravity of the substance. Here is a piece of steel 10 centimeters long, one centimeter wide, and one-tenth of a centimeter thick (one millimeter). What is its weight?

Now you first find out the cubical contents of this piece of steel by multiplying together the length, breadth, and thickness expressed in centimeters so as to have the answer in cubic centimeters. It is 10 centimeters long and 1 centimeter wide; 10 times 1 is 10. It has a surface of 10 square centimeters, it is one-tenth of a centimeter thick. One-tenth of 10 is 1; that is, its volume is 1 cubic centimeter. Now multiply this by the specific gravity of steel and this will give you its weight expressed in grams. The specific gravity of steel, if I remember rightly, is somewhere about 8; that is, a piece of steel weighs about 8 times its own volume of water. Eight times 1 is 8. This piece of steel then weighs about 8 grams.

Now this happens to be a very simple case; but the process would give you the weight in grams, whatever the dimension of your piece of steel might be. If its volume should be one million cubic centimeters its weight would be eight million grams; that is, if I have correctly expressed the specific gravity by 8. If you wish to express this weight in kilograms, simply shift the decimal point three places to the left. A weight of 8,000,000 grams is equivalent to 8,000 kilograms.

The Chairman: The unit of length is what?

Mr Bell: One meter. A centimeter is one-hundredth part of that.

The Chairman: And that is equal to one liter, which filled with water is one kilogram, the unit of weight?

Mr Bell: The gram is the unit of weight; and one cubic centimeter of water weighs one gram. The liter is the unit of volume. It is equivalent to a cubical space 10 centimeters long, 10 centimeters wide, and 10 centimeters deep. It therefore holds 1,000 cubic centimeters of space; and if filled with water, the water would weigh 1,000 grams (or 1 kilogram).

The fact that one liter of water weighs one kilogram is easily remembered; but if forgotten the knowledge is readily recovered from the basal fact that one cubic centimeter of water weighs one gram (the unit of weight).

THE NEW NAMES SIMPLE WHEN UNDERSTOOD

To an American the metric system appears at first sight to be much more difficult of acquirement than it really is, on account of the un-English appearance of the terminology. After you have once mastered the meaning of the prefixes employed, the whole terminology appears to be beautifully simple and appropriate, the words expressing by their etymology the numerical relation to the units of the system.

Thus when we know that *deka* means ten, *hecto* one hundred, and *kilo* one thousand, we see at once that a *dekameter* means 10 meters, *hectometer* 100 meters, *kilometer* 1,000 meters. So with the multiples of gram: A *dekagram* means 10 grams, *hectogram* 100 grams, and *kilogram* 1,000 grams. So also, when we know that *deci* means one-tenth, *centi* one-hundredth, and *milli* one-thousandth, we see at once that *decimeter* means one-tenth of a meter, *centimeter* one-hundredth of a meter, and *millimeter* one-thousandth of a meter. In a similar manner when we examine the subdivisions of gram we see that a *decigram* means one-tenth of a gram, *centigram* one-hundredth of a gram, *milligram* one-thousandth of a gram, etc.

The foreign words employed need be no bar to the use of the metric system,

for they are really not necessary to the system at all—the English equivalents would do as well. It is convenient, however, for many reasons to have some means of expressing all these various denominations in specific words coined for the purpose, although the names are not all of equal importance. As a matter of fact, many of them are seldom used, and a few suffice for ordinary purposes. This greatly simplifies the nomenclature for English-speaking persons.

You will appreciate the point by reference to our monetary system. Our system of coinage provides for eagles, dollars, dimes ,cents, and mills; but, as a matter of fact, dollars and cents are sufficient for all ordinary purposes. We do not reckon money by eagles or dimes, and mills are hardly ever alluded to excepting by Congressmen and statisticians.

So, on the metric system, the terms *kilogram* and *gram* are generally sufficient to express weight; and the other terms provided, which Americans find some difficulty in remembering, are really of little importance because so seldom used.

The *meter* and *centimeter* are generally sufficient for ordinary purposes, although *millimeter* is also needed for fine measurements, and *kilometer* for long distance comparable to our mile, though little more than half its length.

The *liter* is necessary also in expressing volumes; but the multiples and subdivisions of it are not much used. These give you what may be called the basal points. It is not really necessary to use the other names, although advisable to possess them in case of need for special purposes.

The Chairman: Just as you would remember pounds and quarts and dollars and cents.

Mr Bell: Exactly.

The Chairman: When you know the value of anything expressed in one denomination you know it in all, by looking at it.

Mr Bell: Yes. And you are relieved of the enormous and unnecessary labor of calculation involved in the use of our present measures in merely translating from one denomination of the system to another.

The Chairman: Now, for the purposes of actual measurement, something has been said about the inch being a more convenient unit than the centimeter.

Mr Bell: I do not see any reason why an inch should be more convenient than a centimeter, excepting that we have become accustomed to it. Usage will familiarize us with the centimeter, and then our judgment will probably be just the other way.

The Chairman: Some of those who oppose the introduction of the metric system say that, so far as its actual use is concerned, there is no difference between the two systems, and others say that the inch is a more convenient unit; that the meter is not a convenient unit. There have been suggestions that it ought to be 40 inches.

Mr Bell: Is not the fact of the matter this: That anything you are accustomed to is convenient?

The Chairman: Yes; I think so.

OUR FOREIGN COMMERCE WOULD BE HELPED TREMENDOUSLY

Mr Bell: The metric system is already in extensive use. It has stood the test of a hundred years, and has displaced the older systems in most of the countries of the old world. The metrical units have proved to be very convenient there, and they will be equally convenient to us when we become accustomed to them and use them.

If we employed them, we would have the same system that is in use in most of the foreign countries with which we trade. The trade and commerce of the United States would then be enormously facilitated by reason of the fact of our using the same weights and measures employed by the people with whom we deal.

We cannot expect a Frenchman or an Italian to translate from pounds and ounces into kilograms and grams, etc.—to go through all this drudgery of translation—simply for the purpose of understanding the value of what he buys from us. So, of course, if he can get the things he wants from a country that already uses his own system of weights and measures he will do so in preference to buying from us, and American trade will suffer. In my opinion, the trade and commerce of the United States will be very much promoted by our adoption of that system of weights and measures which alone has any chance of becoming universal—the metric system.

The trade of Great Britain is already suffering from the competition of metric-using countries, and if we also adopt the system it will not be long before she follows our example. Then the metric system will become in fact the international system of the world.

We are better prepared to make the change than the British because we have already become accustomed to a decimal currency, and can therefore appreciate the benefits we derive from the application of the decimal principle to monetary affairs. I am hopeful, therefore, that our people may be made to see by analogy that we would derive similar benefits from the adoption of the decimal principle in our system of weights and measures.

WOULD NEW TOOLS IN OUR WORKSHOPS BE NECESSARY?

The Chairman: A good deal has been said on this point: We have been told that if we adopt the metric system it will necessitate the use of new tools and new workshops and thereby become a matter of great expense to our manufacturers.

Mr Bell: That is a matter for very grave consideration, and I think that the difficulty has been unduly magnified. While of course some of our more enterprising manufacturers would construct new machinery and tools specially adapted for metrical work, it does not necessarily follow that the old machines and tools would not be used for the purpose. The fact is that the change does not necessarily involve any change in tools or machinery at all—or at least not to any great extent. It is a question of arithmetic, not of tools or machinery. You can measure the work or output of the present tools and machinery just as well by the metric system as in the ordinary way. You can express the dimensions and weights of all the parts of the old machines, where required, by the metric system, and though the measurements might not be exact to a fraction of a millimeter or a fraction of a gram, they could be rated at their true metrical value, or at a closely approximated value in exact measure. It is only where very fine and accurate measurements are required that special tools would be needed.

The Chairman: In making a brand-new machine you very often have to have special tools in order to economically manufacture the machine.

Mr Bell: Yes. Of course the change would lead to the production of tools and machinery specially made for the metric system; but whether these tools are specially for this purpose or not, they can be measured by the metric system.

The Chairman: You mean by that this, do you not, Doctor: That eventually it would come to be that they would manufacture in even metric sizes as they now manufacture in even sizes of the English system?

Mr Bell: Yes, sir.

The Chairman: But it would not be an impossibility or a very great inconvenience to manufacture by the sizes they already have?

Mr Bell: No. I mean it would not be necessary to throw away the machinery and tools they now have, because generally you would have a sufficient approximation to some exact metrical measurement for practical purposes. We can

approximate say to a sixty-fourth of an inch, or a fraction of a millimeter, which would be near enough to precise figures ordinarily. The old tools and machinery need not be thrown away; they can be used during the transitional period at whatever may be their metrical value. A tool or machine has only a limited life. It may last, say, ten years, and then it must be replaced. After the adoption of the metric system the new machinery made would certainly be constructed to an exact metrical scale. The old machinery, however, so long as it lasted, would be measured by the metrical system, and you would simply rate it at its nearest equivalent in the metric system.

*Mr Scroggy:** I would like to ask a question in that connection. This bill, you must observe, uses the language that in the transaction of business requiring the use of weight and measurement the government shall employ and use the weights and measures of the metric system. That apparently is mandatory. Now could you suggest to this committee some amendment to that language by which the present tools, the tools now in use for manufacturing machinery that is now being manufactured, could still continue to be used, and at the same time adopt the metric system as contemplated by this bill?

Mr Bell: I do not think, sir, that this requires any amendment. The bill is only mandatory concerning the system of arithmetic to be used (the metric system), and leaves the question of tools, etc., open. It relates simply and exclusively to a method of measurement: The weights and measures of the metric system shall be used—that is all. It does not prescribe the kind of tools or machinery or limit it in any way.

Mr Scroggy: Do you think that the language would admit of the use of the present tools?

Mr Bell: You mean in the government departments?

Mr Scroggy: Yes.

Mr Bell: I have not hitherto given that point consideration, but I should think that it would. It simply refers to the measurement of them. Take the present tools and measure them in the metric system.

I thought you referred especially to outside firms undertaking business for the government, and whether they would be required to have new tools and machinery made in undertaking government work. I don't think they would, under the language of the bill. I have no doubt that some enterprising manufacturer would have metrical tools and appliances made for use in government work, though this does not seem to me to be required by the bill. The same remarks apply to the tools and appliances at present in use in the government departments themselves. I can see nothing in the bill to require their abandonment and replacement by tools specially constructed for metrical measurement. The present tools can be measured metrically, which is all that is required by the present bill, so far as I understand it. I do not therefore see why any amendment is required to permit the use of any kind of machinery that may be desired. The bill simply prescribes that in the transaction of business requiring the use of weight and measurement the departments of the government shall use the weights and measures of the metric system. Under this language I take it that you can use anything under the sun if you measure it by the metric system. You can use a pound weight if you please, if you put it down at 454 grams.

The Chairman: It would require the use of metric weights and measures, for instance, in the Treasury Department in determining our imports and things of that kind.

Mr Bell: Oh, yes.

The Chairman: There would be no difficulty about that, I should think.

Mr Bell: I don't think there would. Indeed, it might be possible that the labor

* Thomas E. Scroggy, Representative from Ohio.

of the department might be lightened, in fact, for I presume that goods imported from foreign countries employing the metric system are invoiced in the countries of their origin by the metric system, and the Treasury Department, or the importing merchants, at all events, would thus be saved the labor of translating the measures. The work of translation of the department would thus be limited practically to imports from Great Britain and her colonies.

The Chairman: Of course the equivalents of the metric system of weights and measures are enacted into law now.

Mr Bell: I believe so. I understand that the use of the metric system is already permissible in the United States by law. It is now competent for any one to use it legally who chooses. This bill takes the next step and makes its use mandatory upon the government departments; and of course if you take that step it means that you are going further with legislation in the future and make it mandatory for the whole country.

*Mr Dresser:** Has not there been some objection made on account of land measurements?

The Chairman: The bills formerly introduced here have always contained an exception, and that exception was the government survey; but that work is so nearly completed now that I am told the author of this bill thought it was not worth while to except that from its provisions.

Mr Bell: Of course there is necessary friction in making the change, but this difficulty only belongs to the transition period.

The Chairman: I suppose there are about three things that the ordinary man or woman—I mean the man who has not any special use for weights and measures, but uses them ordinarily in trade—would have to remember, and that is the liter, the meter, and the kilogram; the liter, one-tenth more than a quart; the meter, one-tenth more than a yard; and the kilogram, one-tenth more than two pounds, about?

Mr Bell: Yes; that is a very simple way of memorizing the radical points.

A CHANGE WOULD CAUSE NO SERIOUS ANNOYANCE

The Chairman: Do you imagine there will be any serious annoyance, so far as what we call the common people are concerned?

Mr Bell: I do not anticipate it. We simply have to be bold enough to take the step. All the difficulties lie in the transition period. All the difficulties in the metric system are in translating from one system to the other, but the moment you use the metric system alone there is no difficulty. The workmen in my laboratory used the metrical weights and measures right off. I did not ask them to translate from one system to the other, for that would speedily have developed their limitations of education. I simply asked them to use the metric system, and they did it without difficulty. They now use meters and centimeters and grams and kilograms as if to the manner born, and they are simply common carpenters and mechanics. I consider them as an average sample of the common people. I do not anticipate any difficulty in the use of the metric system by itself; and if the government will lead the way, the change must and will come, and we will be brought into line with the progressive nations of the world, instead of lagging behind.

Mr Scroggy: Legislating for the future and not for the past generations?

Mr Bell: Yes, sir. Our forefathers legislated pretty well for the future in the adoption of the Constitution; and, later, Congress did well in abolishing the old system of pounds, shillings, and pence and adopting the decimal system for our money; and we will do well for the future of our country if we provide the metric system for the whole of the United States.

* Solomon R. Dresser, Representative from Pennsylvania.

S. P. LANGLEY

S. P. LANGLEY, Secretary of the Smithsonian Institution, 1887-1906, who died on February 27, was probably the first astronomer to succeed in making money for the public out of his profession. When he was appointed director of the observatory at Allegheny its resources comprised a building and very few instruments. He had to raise money before he could do any scientific work, and it occurred to him that the easiest and most useful way of doing this was to sell a standard time to the railways. In 1866 the railroads east of Chicago were running on different local times, and there was considerable confusion in consequence. Mr Langley proposed to determine his time from the sun and to sell it to the railways. His plan proved very popular with them, and the writer was informed by Professor Langley a few months before his death that he obtained in this way about $60,000, with which he equipped the observatory and continued his solar work. Mr. Langley thus originated our system of standard time in the United States.

Professor Langley believed that the most important work for astronomers was to study the sun, which is the basis of all life on the earth.

He wrote a delightfully entertaining book on this subject, illustrated from his own drawings and published by The Century Company, called "The New Astronomy."

At the Allegheny Observatory and on his various expeditions to Mount Whitney and elsewhere, as well as during the twenty years he directed the Astrophysical Observatory at Washington, the character of the sun, sun-spots, the solar constant, etc., formed the principal object of his researches.

His invention of the bolometer, which registers as small a change in temperature as one-hundred-millionth of a degree of heat, enabled him to extend the visible spectrum many times beyond what was previously seen.

It is not the purpose of this brief note to enumerate Professor Langley's scientific achievements, but rather to direct attention to the wide range of subjects to which he actively contributed. An architect in early life; later a professor of mathematics in Harvard University; the originator of our system of standard time; he re-established the solar constant; discriminated and accurately determined, by their temperature alone, over 700 lines in the invisible infra-red spectrum; discovered important principles in mechanical flight; was one of the principal promoters of our National Zoölogical Park, and possessed a literary talent which enabled him to describe the most abstruse scientific facts in a manner intelligible and fascinating to all.

But his greatest contribution was his work in aerodynamics and on the internal energy of the wind. His experiments and published results on the dynamics of the air are the foundation of the flying machines of the future. Mr Langley was the first American to maintain that the flying machine must be of the "heavier than air" instead of the balloon type, demonstrating that less energy is required to support a heavy body in rapid velocity than in slow velocity.

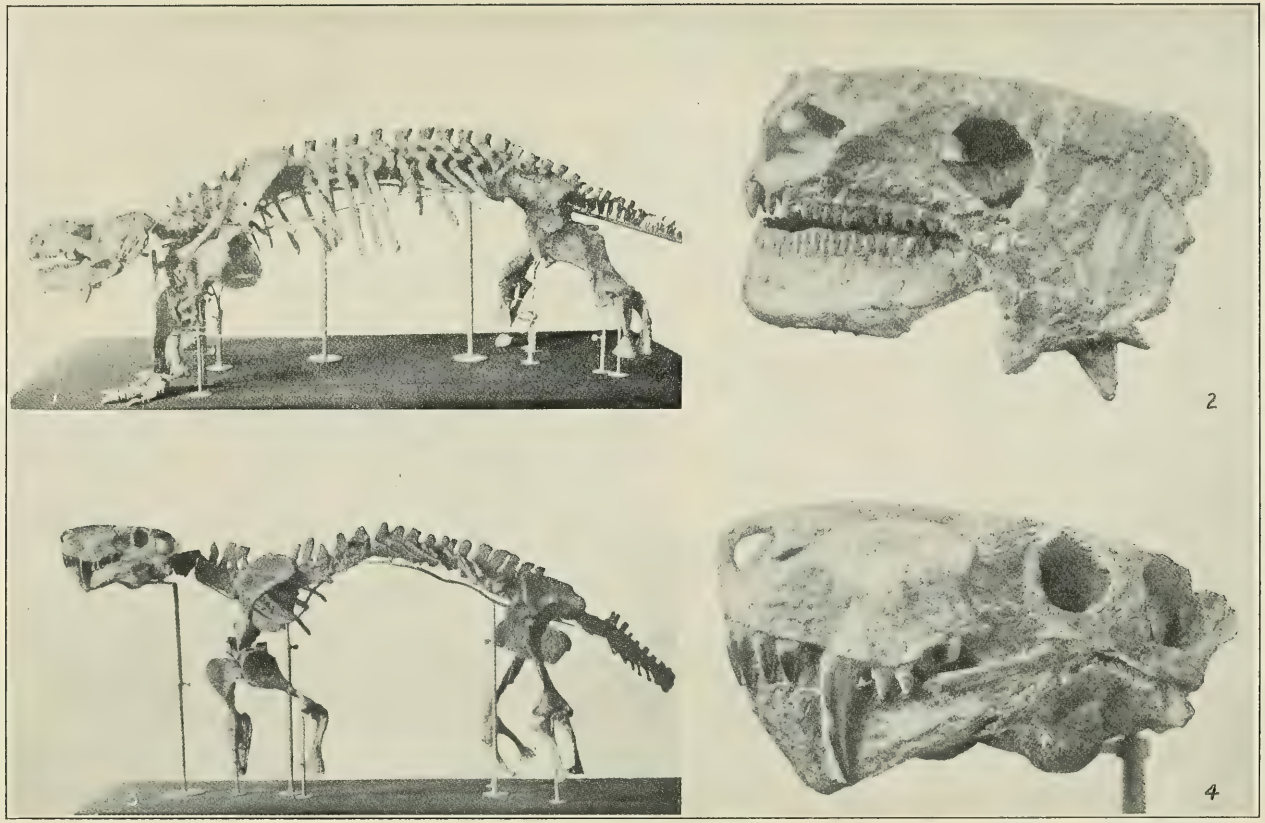
EXTINCT REPTILES FOUND IN NODULES

THE sandy cliffs of the river Dwina, near Archangel, in northern Russia, are discolored in places by pockets of darker material, from which the local road-builders have been accustomed to extract nodules of stone for mending the roads.

Professor Amalitzky, of Warsaw, on visiting this locality a few years ago, was astounded to find that each nodule contained the bones of an extinct animal. Some of the larger nodules contained the head, limbs, and even the

From "Extinct Animals," by E. Ray Lankester, Henry Holt & Co.

1. View of one of the Dark Patches in the Cliffs of the River Dwina (the northern of that name), where nodules containing the skeletons of extinct reptiles are found
2. Prof. Amalitzky's Work-shop in Warsaw, showing skeleton-holding nodules ready to be broken open and others already under preparation
3. Peasants working on the face of the Cliff near Archangel and removing nodules containing the skeletons of great reptiles
4. A Series of Skeletons of Pariasaurus removed bit by bit from Archangel nodules and mounted as detached specimens by Prof. Amalitzky



From "Extinct Animals," by E. Ray Lankester, Henry Holt & Co.

1. Photograph of a Skeleton of Pariasaurus removed from an enveloping nodule and mounted by Prof. Amalitzky
2. Photograph by Prof. Amalitzky on a larger scale of a Skull of a Pariasaurus from an Archangel nodule
3. Skeleton of a Huge Carnivorous Beast of Prey, the reptile named Inostransevia, discovered and photographed by Prof. Amalitzky, of Warsaw. The skull alone is two feet high
4. Skull of the Gigantic Theromorph Carnivorous Reptile, Inostransevia, discovered by Prof. Amalitzky in northern Russia. It is allied to Lycosaurus, found in Cape Colony in beds of the same age

entire skeleton of a creature about eight feet long.

Large numbers of these nodules have been transferred to the laboratory of Professor Amalitzky, where they have been opened and the contents studied. The contained bones, which appear to be the remains of reptiles of Triassic age, have been carefully extracted and put together in skeleton form by means of iron supports. Several skeletons have thus been revealed of the extinct *Pariasaurus,* a vegetarian reptile about as large as an ox, but not so high in the legs.

The nodules have also disclosed the remains of a huge carnivorous reptile

One of the Nodules, showing form of the embedded skeleton; head to right, tail to left

with a skull two feet long and enormous tiger-like teeth—a truly terrible creature which has received the equally terrible name of *Inostransevia* from its discoverer, Professor Amalitzky.

No doubt the vegetarian herds of *Pariasaurus* were preyed upon by the carnivorous *Inostransevia* in the old days—now hundreds of thousands of years ago—when they roamed at large over the territory now known as northern Russia.

A brief account of Prof. Amalitzky's discoveries is given in a recent work on "Extinct Animals" by Dr. E. Ray Lankester, of London, England, from which the above facts have been extracted. (Published by Henry Holt & Co., New York, 1905.) The whole book is of fascinating interest. It is written largely in untechnical language, and is plentifully illustrated by photographs and drawings of the remains of extinct animals. The author's name is a sufficient guarantee of the excellence of the work and the reliability of the information. H. A. LARGELAMB.

AMERICAN GOODS IN CHINA

A NUMBER of photographs have been sent to the Bureau of Manufactures by Special Agent Crist showing the condition of the average American case or bale of goods on arrival in Tientsin, China. Three of these photographs are given on pages 174-175, by courtesy of the Bureau, and also a photograph of some Holland bales that arrived at the same time. Mr Crist reports that from the place where he took the photographs at least 500 more American bales in equally bad shape were to be seen. Those in best condition were bound with iron straps, while the rope-tied bales suffered the most.

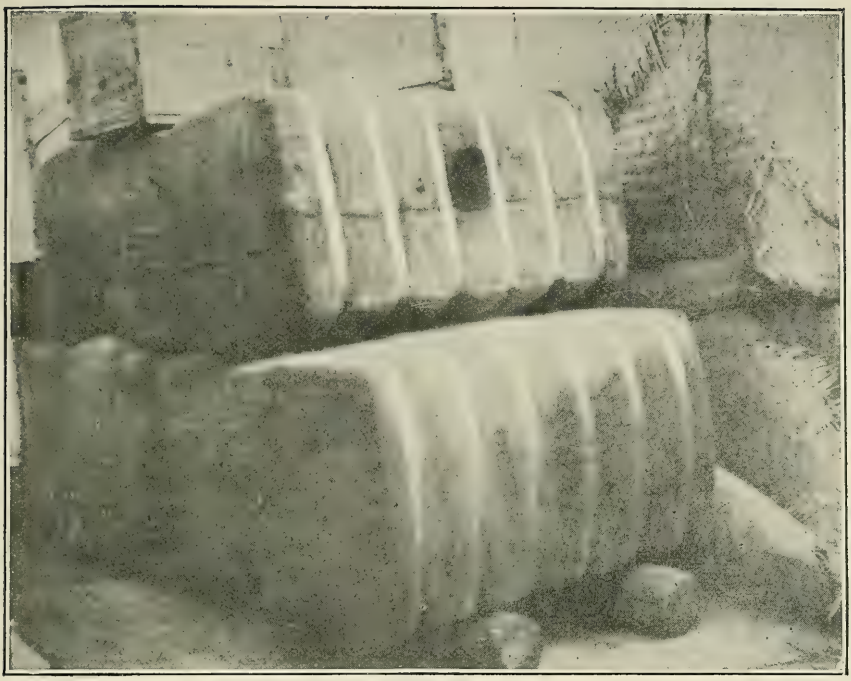
EVIDENCE OF RECENT VOLCANIC ACTION IN SOUTHEAST ALASKA

THE following interesting geographical information is extracted from a report by Mr Fremont Morse, of the U. S. Coast and Geodetic Survey, who was recently engaged in the demarkation of the Alaskan boundary line across the Unuk River, and is published here through the courtesy of Mr O. H. Tittmann, Superintendent of the U. S. Coast and Geodetic Survey. The Unuk River flows into Burroughs Bay about 95 miles north of the southern boundary of Alaska. The locality described is inland at the boundary and about 30 miles from the mouth of Burroughs Bay.

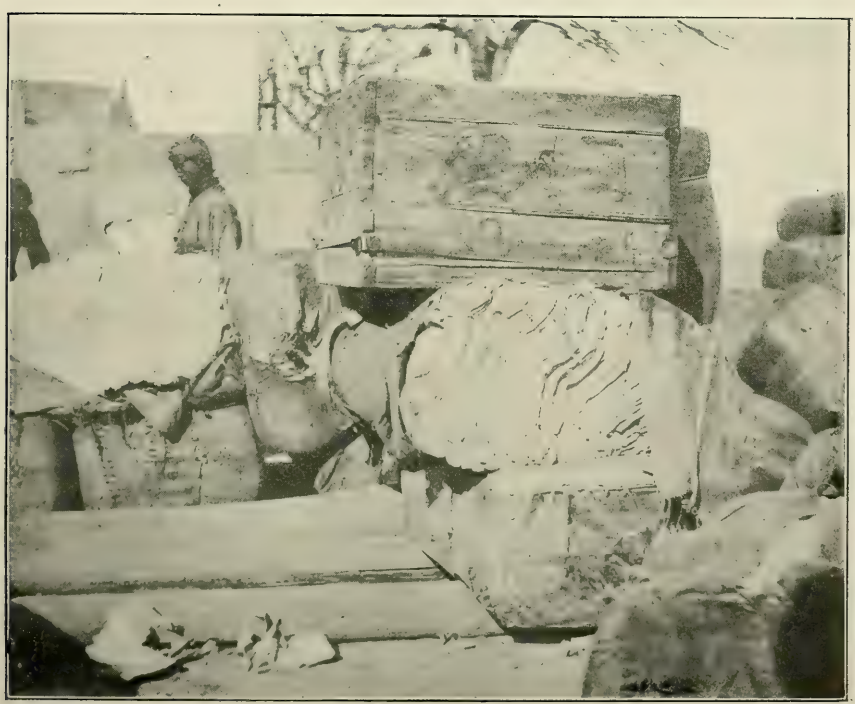
The largest tributary to the Unuk on the north side, between Burroughs Bay and the boundary, occupies a valley of considerable size between boundary peaks 6,200 and 6,500. This stream is

Condition of American Case Goods on arrival at Tientsin, China

Trusses of American Piece Goods on arrival at Tientsin



Bales of Piece Goods from Holland on arrival at Tientsin



A Typical Pile of American Piece Goods on arrival at Tientsin

locally known as Blue River, and it empties into the Unuk River in the first canyon. This canyon has been formed by a lava flow which came down the Blue River valley and forced the Unuk stream over against the foot of the mountain on the south bank. This flow is comparatively recent, but occurred long enough ago for large trees to have grown up over its surface. A still more recent flow, which probably occurred within less than fifty years, has swept down the Blue River valley, destroying all the vegetation in its path. This flow stopped within about 200 or 300 yards of the river, and the charred and blackened trunks of trees overwhelmed by it are still visible at its termination. Since the flow ceased there has been time for only a few mosses and lichens to gain a foothold on the lava masses. The floor of the Blue River valley, as formed by this lava, is exceedingly rough and broken up, and it is very difficult to travel over it. It was stated to us that, owing to the extreme difficulty of crossing the lava, the farthest point ever reached up the valley is seven miles, which distance was once made by a prospector in three days' travel. In a letter sent Mr Tittmann after the report, Mr Morse adds:

"I judge the lava flow had its source in the region north from 6,200, say within 10 miles of that peak. The ruggedest mountains in the vicinity are there and look as if they are volcanic. Looking in that direction from 6,200, there is seen a glacier whose entire front is black with cinders. The glacier on the north side of 6,200, which has its lower extremity at an altitude of about 3,500 feet, is still discharging cinders that probably fell during the last eruption. So also the ledges that are exposed during the summer above 3,500 feet have cinders scattered over them, and that too in exposed places where it seems improbable that the cinders could rest many years without being blown away by winds or washed away by rains. At present there is no sign of an active volcano in that region. Mr Wright, of the Geological Survey, who made a trip up the Unuk River in August, made the ascent of 6,200 to see the surrounding country; but it was a cloudy day and he did not get the view which I have mentioned. He suggested that a lava flow does not necessarily imply a volcano, but may come from a fissure, and that just in that region is the line between the coast granites and the interior rocks. However that may be, it is certain that there were lively times around the Blue River valley not many years ago.

"The second canyon of the Unuk was formed in precisely the same way as the first, and by a lava flow which had its origin in about the same locality, but which, instead of flowing down the Blue River, broke out and flowed down the other side of the range on which 6,200 is located. All this flow is clad with timber and occurred long ago."

THE WONDERFUL STRIDES OF AFRICA

THE article on "Morocco" published in this number is the first of a series of articles on different parts of Africa which will appear in THE NATIONAL GEOGRAPHIC MAGAZINE at intervals during 1906. The following papers, all of which will be illustrated, have been arranged: "Africa from Sea to Center," by Herbert L. Bridgman, being an account of the development of Egypt and more particularly of the Sudan, of Khartoum, and the upper reaches of the Nile; "Capetown, the Transvaal and Rhodesia," by William M. Davis, professor of geology in Harvard University, who will tell of the amazing progress of South Africa since the war and of the labor and race problems there, which are far more complicated than our own similar problems; "Northern Nigeria," by Mr Douglas Hume, a member of the National Geographic Society, who for three years past has been in Northern Nigeria; this paper will describe the peaceful annexation and

commercial development by the British during the last five years of 500,000 square miles in equatorial Africa, with a vigorous semi-civilized population of 20,000,000; "The French Empire in Africa," being an account of the French work in Algeria, Tunis, and more especially their ambitions for the transformation of the Sahara Desert, by Charles Rabot, editor of "La Geographie," of Paris.

U. S. BOARD ON GEOGRAPHIC NAMES

IT is hereby ordered that there be added to the duties of the United States Board on Geographic Names, created by Executive order dated September 4, 1890, the duty of determining, changing, and fixing place names within the United States and insular possessions, and it is hereby directed that all names hereafter suggested for any place by any officer or employee of the government shall be referred to said board for its consideration and approval before publication.

In these matters, as in all cases of disputed nomenclature, the decisions of the board are to be accepted by the departments of government as the standard authority.

THEODORE ROOSEVELT.

The White House, January 23, 1906.

GEOGRAPHIC LITERATURE

Jungle Trails and Jungle People. By Caspar Whitney. Pp. 310, 8 vo. New York: Charles Scribner's Sons. 1905.

A series of fascinating narratives of hunts for big game in Siam, Burma, the Malay States, and Sumatra, sprinkled through which is a lot about the country and the people, their life, thoughts, and characteristics. One is struck with the characterization of the Malays of the Federated States, which holds good wherever Malays are found. "He was very rarely the bloodthirsty, sullen, silent creature of which we have had so often the pen picture. He is, to be sure, thriftless, indolent, unambitious, but he is polite, good-natured, contented . . . above all else . . . the Malay is intensely self-respecting . . . He is reserved, self-contained . . . He resents insult so strongly that bloodshed may result . . . is deliberate of speech . . . and is not demonstrative. He walks erect and he looks you in the eye." The Philippine Malay is all this, except that he is ambitious, and will work to better his condition.

The book is printed on heavy paper, and is beautifully and appropriately illustrated H. G.

From "Africa," by Frank G. Carpenter, Copyrighted

Disembarking Passengers, Portuguese East Africa. The passenger enters the basket and is swung overboard.

Carpenter's Geographical Reader — Africa. By Frank G. Carpenter. Pp. 336. Six maps and numerous illustrations. 7½ by 5½ inches. New York: American Book Company.

With this volume Mr Carpenter completes his series of Geographical Readers

of the World, the volumes on "North America," "South America," "Europe," "Asia," "Australia, Our Colonies, and other Islands of the Sea" having preceded this one. The readers are designed for young people. They are written in simple and interesting language and the facts are in the main correct. Their popularity is attested by the statement that more than one million copies of the volumes have been sold.

Far East (The). By Archibald Little. Illustrated. Pp. 342. Oxford: The Clarendon Press. 1905.

This is a description of the Chinese Empire and its neighbors, from Manchuria to Siam, and from Turkestan to Japan. Despite its literary defects, it is a welcome handbook, its value being enhanced by charts and maps, especially those on railways, population, ethnography, orographic features, and vegetation. The chapters on Siam, Tibet, Turkestan, and Japan are inferior to those on the central kingdom—China.

The account of the middle basin, the Yangste, is comprehensive and interesting, the author speaking largely from personal study, evidently not like a writer he describes, who "labored under the disadvantage of never having lived in the country."

He forcibly presents the relative size and importance of China and other countries, and gives much needed information as to local geography, geology, and climate.

Most instructive is the irrigation district in Szechuan province, 2,800 square miles, as "the most highly productive and thickly populated piece of land of its size on the face of the globe." Its skillful and continued maintenance "is due to the absolute dependence of the five millions of people on the Chengtun Plateau upon the minute organization of their irrigation system."

The unreliability of statistics as to population is well illustrated by two estimates as to the population of Annam, Tongking, and Laos, 6,200,000 by Bernard (1901) and 15,400,000 by Beauclerc (1900).

Americans may well take to heart Mr Little's opinion, the outgrowth of long experience and reflection, that consideration and fair dealing in all commercial and economical matters are essential to successful relations with the Chinese.

A. W. G.

NATIONAL GEOGRAPHIC SOCIETY

Popular Meetings

National Rifles Armory, 920 G street, N. W., 8 p. m.

Friday, March 2—"Our Immigrants: Where They Come from, What They Are, and What They do After They Get Here." Illustrated. Hon. F. P. Sargent, Commissioner General of Immigration.

Thursday, March 15—"Castro and Venezuela." By James F. T. Archibald, of Collier's Weekly.

Friday, March 23—"Oriental Markets and Market Places." By Hon. O. P. Austin, Chief U. S. Bureau of Statistics. Illustrated.

Friday, March 30—"United States Eclipse Expedition, 1905." By Rear Admiral Colby M. Chester, U. S. N.

Tuesday, April 13—It is hoped that official business will permit the Secretary of the Navy, Hon. Charles J. Bonaparte, to address the Society on "The American Navy."

Scientific Meetings

Hubbard Memorial Hall, 8 p. m.

Friday, March 9—"The United States Bureau of the Census." By Hon. S. N. D. North, Director, Bureau of the Census.

Saturday, March 24—"The Death Valley." By Mr Robert H. Chapman, U. S. Geological Survey.

Friday, April 6—"Hunting with the Camera." By Hon. George Shiras, Member of Congress from the third district of Pennsylvania.

Friday, April 20—"The Protection of the United States Against Invasion by Disease." By Dr Walter Wyman, Surgeon General Marine Hospital Service.

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AGRICULTURAL EXPLORER, IN CHARGE OF FOREIGN EXPLORATIONS

THE POLAR AIRSHIP

(ILLUSTRATED)

BY WALTER WELLMAN

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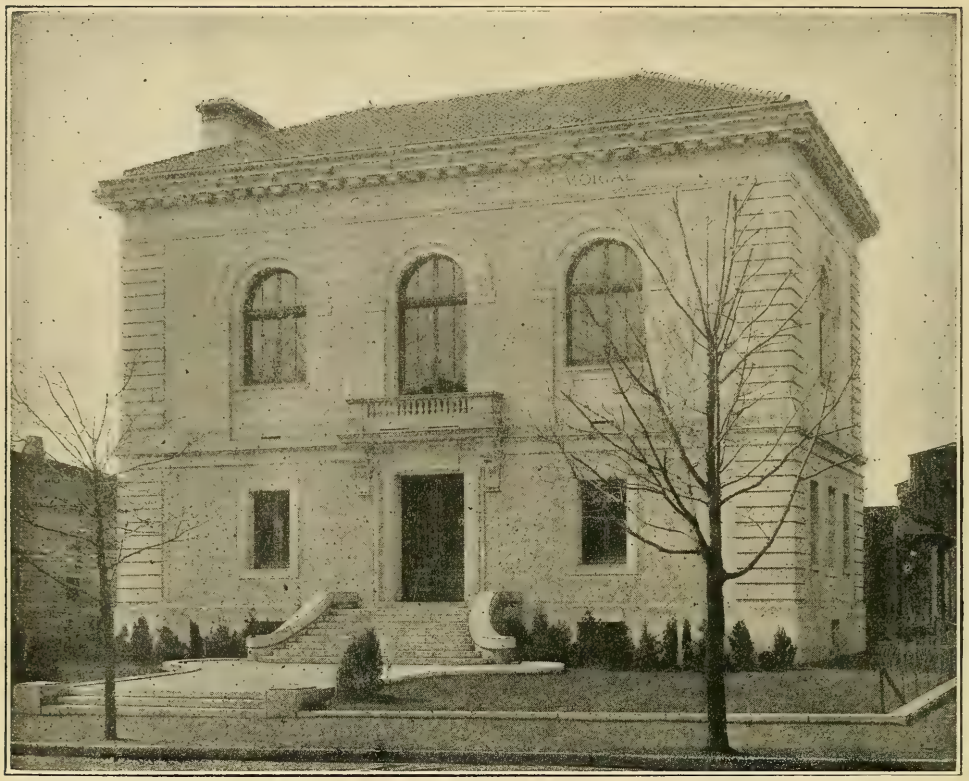

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THE NATIONAL GEOGRAPHIC MAGAZINE

OUR PLANT IMMIGRANTS *

AN ACCOUNT OF SOME OF THE RESULTS OF THE WORK OF THE OFFICE OF SEED AND PLANT INTRODUCTION OF THE DEPARTMENT OF AGRICULTURE AND OF SOME OF THE PROBLEMS IN PROCESS OF SOLUTION

By David Fairchild

Agricultural Explorer, in Charge of Foreign Explorations

THE era of pork and hominy has passed forever in this country, but so short a time ago that our fathers refer to it as the time of plain living. What has wrought this change throughout the table menus of the country since the days of the California gold fever? It is not the gold fields of the Pacific slope, nor the industrial development of the country that has caused it, so much as the introduction of new food plants. The changes that have been going on since those wagon caravans followed each other across the great plains have been gigantic, but in no respect have they been more remarkable than in those which Plant Introduction has brought about.

Slowly at first, with the establishment of those plants that the immigrants brought over with them, this work has gone on, unchronicled by historians, until today the very things that we look upon as characteristic of great regions of the country are vast fields and enormous orchards of introduced plants.

SOME NOTED IMPORTATIONS

The discovery of gold at Sutter's mill was the beginning of the great industrial development of the Pacific coast, but the introduction by the Catholic Fathers of a single forage plant—alfalfa—has turned two million acres of land into the most generally profitable farm area of this country.

These same Fathers brought with them to their missions olive cuttings, whose descendants today cover thousands of acres of the best tilled olive orchards in the world. A few orange cuttings from the east coast of Brazil, called to the attention of the world by an American woman, have grown until they number

*The substance of an address to the National Geographic Society, February 9, 1906, and published by permission of the Secretary of Agriculture.

their descendants by millions and form what is one of the characteristic features of California—its orange groves.

The tomato, which before the war was a curiosity from Peru and was used to frighten slaves into obedience, because they thought it poisonous, was grown last year on over half a million acres of garden land.

The lima bean, whose arrival in this country no historian has considered worthy of chronicling, has so grown in importance since its introduction, some time about 1820, that today special freight rates are granted it between southern California and the Atlantic coast, and thousands of acres of land where the rainfall is extremely light are devoted almost exclusively to the cultivation of this Peruvian bean.

The potato, from the highlands of Colombia and Peru; the rhubarb, from central Asia; the asparagus, from England, and even the celery of southern Europe, have all been, one after the other, introduced into our fields and gardens.

Though these great changes in the farm and garden areas of the country have been wrought in less than a lifetime, they have still been too slow, and today changes as far-reaching and important as the introduction of the olive or the orange are being brought about by government aid in a surprisingly short time.

The Department of Agriculture is growing in this country some of the things that we now import and for which we pay annually many millions of dollars; it is forcing into public notice and encouraging the trial of foods that the people of other countries find excellent and of which we are ignorant; and it is bringing in from all parts of the world plants that are now wild, but that can be tamed by breeding with others now in cultivation, thus contributing to the creation of fruits and vegetables that the world has never seen before.

This is the government enterprise of Plant Introduction—to introduce and establish in America as many of the valuable crops of the world as can be grown here; to educate the farmer in their culture and the public in their use; to increase by this, one of the most powerful means, the agricultural wealth of the country.

OUR FARMS AND FARMERS THE BEST IN THE WORLD

No nation in the world has an agricultural territory with a greater range of climatic conditions than the United States and its possessions. Great Britain, "on whose flag the sun never sets," has her colonies scattered through all the possible ranges of climate, but America has in one great connected area a territory that is exposed in its north to a temperature of fifty degrees below zero in winter and whose southern tip juts out into the zone of perpetual warmth.

This great farm land is peopled from one end to the other with pioneers; not with peasants whose fathers and grandfathers were peasants and who follow blindly in the footsteps of their forefathers, but with men who have the spirit of change in them and who are looking for anything that will pay better than what they already have. These pioneers, through the daily press and by means of the rural free delivery, are keeping in touch with the plant industries all over the world. They know what the wheat crop of the Argentine is likely to be, and whether Russia's output of this grain will affect the price of the wheat in their stacks. They see accounts of plant cultures in other lands that they would like to try in their own fields or gardens, and they have the time and the money and the land necessary; but they cannot get the seeds or plants to experiment with, nor do the papers tell enough to enable them to judge whether there is any chance of successfully growing these strange crops on their land.

"NEW THINGS TO GROW"

Millions of dollars are waiting to be invested in these new crops, and hundreds of thousands of private experimenters are ready to try new things.

A flood of emigration has set in from our great cities to the country, and the emigrants are not poor people, nor ignorant, but are in large part the wealthy and intelligent, few of whom are willing to follow in the old ways of farming and gardening. They want something new to grow, not always because they think it will be more profitable, but because they will get more amusement out of it. To manage a farm and make it pay along the old lines is indeed a great accomplishment, but to take up something entirely new and prove that it will grow and be profitable gives the same kind of pleasure that always comes to one who makes two blades of grass grow where one grew before. It is the keen pleasure of discovery, the old pioneer spirit, that is turning from the creating of new business projects into new fields of agriculture. These are the new conditions in American agriculture that must be met by new means, and the Department of Agriculture, through the Office of Seed and Plant Introduction, is striving to meet these demands. This office, with its small appropriation of $40,000 a year for the introduction of foreign plants, is getting seeds and plants from the most remote corners of the world for thousands of private experimenters and for the state experiment stations of the country. Over a dozen new things a day are entered on the list of new arrivals, and these new seeds or plants arrive by mail, express, and freight, in quantities varying from a single cutting in a tin tube to a ton of seed of some African or Arabian grain.

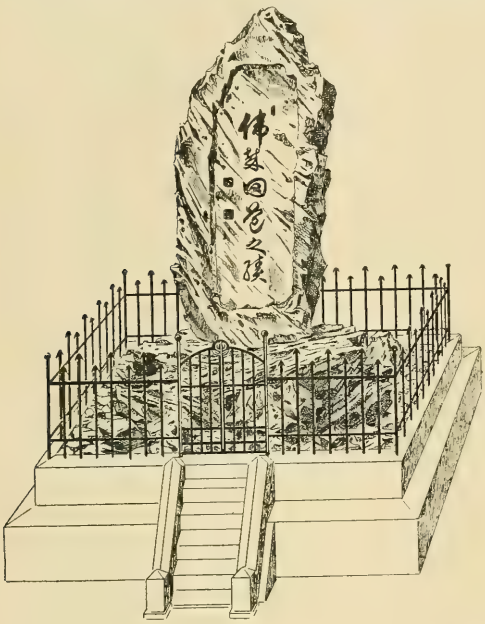
These things are not sent broadcast over the country; they cannot be had merely for the asking. Each new shipment represents a well-thought-out problem, for which some preparation has been made, and the seed is too valuable to be wasted by putting it in the hands of those who want it merely because it costs nothing, or who live in a region which the meteorological data in the office excludes from consideration as a place where the new plant is likely to find a congenial home. The new arrival goes out to some experiment station or to some one who has satisfied the office that he has the necessary means to take care of it and the soil and climate in which it will be likely to grow—to experimenters, in other words, who have demonstrated their ability to try new plants. These are chosen from the organized institutes of research in each state and by correspondence with private individuals.

AGRICULTURAL EXPLORERS

The securing of these things from the ends of the earth is a work that has required the employment of exceptional men, whose enthusiasm for discovery would take them into dangerous places and whose training had fitted them to tell at a glance whether there was in a new plant the possibility of its utilization in this country. These men have been botanists in the main, but not collectors of dried plants. They have been investigators of new crop possibilities, and have kept always in view the fact that what the country wants is something that will grow and be profitable. The finding of a new species did not distract them from the object of their search, which was to find the plant, whether new to science or not, that was wanted for the improvement of an existing industry or the establishment of a new one.

The ground covered by these agricultural explorers has been great, and in this work of exploration the office has been most fortunate in enlisting the personal support of America's greatest traveler, Mr Barbour Lathrop, of Chicago. Mr Lathrop, at his own expense, conducted his explorations for nearly six years into most of the promising plant-growing regions of the world, taking the writer with him in all his travels as his expert. With the host of correspondents established

during these long voyages and those made by the various agricultural explorers that the office itself has kept in the field, the machinery of getting new plants is better organized in this office than anywhere else in the world. We have traversed the Russian steppes and entered Turkestan; we have scoured the coast of North Africa from the Suez



Monument in Churchyard of Fukushoji, Province of Kii, Japan, erected as a memorial to the man who first introduced citrus fruits into Japan 1,800 years ago. His name was Tajima Mori, and he was sent to China by Imperial order to obtain the citrus fruits. It took him nine years to secure the plants for introduction. The monument bears the following inscription: "How Magnificent is the Result of Tajis' Work"

Canal to Morocco, visiting oases in which no white man has been for twenty-five years; we have investigated the industries of Italy, Greece, and Austro-Hungary; the Valley of the Nile, with its host of irrigated crops, has been given a thorough study; Japan, with its peculiar and suggestive agriculture, has been drawn upon by our explorers; India and the Dutch East Indies, with their wealth of material of value for the warmer portions of the country, have been touched, but not yet explored; Arabian date regions have been visited and their possibilities exploited; South America has been given a short visit of reconnaissance; and East Africa, Cape Colony, and the Transvaal, Sweden, and Finland have been visited but not explored. The almost unlimited plant resources of the Chinese Kingdom are being probed by a trained agricultural explorer, Mr Frank N. Myer. Hosts of things are coming in from his explorations that we are not yet in a position to talk about, since few of them have left the cool chambers in which they will remain until planting time, in the spring. Hardier persimmons and peaches from the original home of the peach, interesting new grapes, luscious Chinese pears, and hardy bamboos are on the long list of things already en route to America.

A glance at the great plant industries of this country shows that they have nearly all of them been influenced in the past and are still being changed and bettered by the introduction of new plants.

THE DURUM WHEAT INDUSTRY

The durum wheat, from which the bread of the common people is made in Southern Europe and Russia, was almost an unknown thing on our grain markets until 1900; but today it is a living question in the milling centers of the Northwest. It is a wheat for the dry lands, where the ordinary kinds grow poorly or not at all, and it yields so much more per acre and is so much surer a crop that, even if it should not bring the highest prices, it will pay better than the less drouth-resistant species which Western farmers have hitherto tried to grow on the dry farm lands of the Dakotas and Nebraska.

Custom still fights the innovation of a new flour, and there are people who think our bread is in danger of being

deteriorated by the new introduction; but they are not the well informed who have tasted the full-flavored durum wheat breads of Spain or Italy or who realize the great and growing future of macaroni as a food in this country. American-made macaroni, prepared with the best of the old American wheats, cannot be compared with the delicate product of a Gragnano factory. But with the culture of this durum wheat in America a change is coming, and the time may come when we shall ship macaroni to Italy instead of importing it at the rate of nearly $2,000,000 worth a year. This innovation in the great wheat industry has been the result of the efforts of Mr M. A. Carleton, who was sent to Russia as an agricultural explorer of the Office of Plant Introduction in 1898 and 1900. The office has distributed thousands of bushels of the durum wheat varieties gathered by him from all the Mediterranean and South Russian countries where it is grown.

THE SMYRNA FIG

One of the most fascinating events in the history of plant introduction was the introduction of the Smyrna fig industry. The Smyrna fig has always been considered the finest fig in the world, and beyond all competition; so it was natural that progressive Californians should wish to see if they could not grow it. Orchards were accordingly started in 1880. They grew well, but the crops of fruit they bore fell to the ground when quite green, and it was evident that something was lacking to make the industry a success. A study of fig culture in Smyrna was made, and it was discovered that a process called caprification was necessary. This consisted in hanging in the trees of the true Smyrna fig the young fruits of another variety of figs that are not edible, but which contain thousands of microscopic wasp-like insects, called *Blastophaga*. These insects creep out of the caprifigs just at the time when the Smyrna figs are in bloom, and, crawling into the latter, they fertilize the hundreds of small flowers of which the fig is composed, and instead of dropping off like unfertilized flowers, the Smyrna figs grow and ripen.

The caprifigs were accordingly imported as cuttings, but again the owner was disappointed when the trees bore, for it was discovered that they had left their tiny insects behind and were worthless. A final attempt was made through the combined efforts of the entomologist of the Department of Agriculture and Mr W. T. Swingle, of the Bureau of Plant Industry, and, in 1899, after nineteen years of effort, Mr Roding's orchard of Smyrna figs was established. It is still the largest in this country and has been yielding large crops of delicious fruit. Sixty-five tons was the output for 1903, and though in its infancy the California Smyrna fig industry is already supplying a portion of the figs now sold in our markets, and these are being put up with a cleanliness unknown in their native land.

JAPANESE RICE

History tells us that the first rice in this country was introduced into the Carolinas in 1695 by the captain of a brig from Madagascar, who gave some seed to Governor Smith and his friends to experiment with, and the result has been an important industry. The rices which chance introduction had brought in were looked upon as the finest in quality in the world and were exported to Europe; but with the call for a whiter and a more polished product than the hand-threshed rice of plantation days came machine-polished rice, and the center of the rice industry was transferred to Louisiana and Texas by the discovery of artesian wells in those states. The machine-polished rice that we buy in this country today is, as every one knows, a truly beautiful thing to look at, but as tasteless as the paste that a paperhanger brushes on his rolls of wall paper. The leather rollers of the machine not only rub off all the fine outer layer of nutritious

matter, and with it the part that gives flavor to the kernels, but they often break the long, slender grains that characterize the famous Carolina golden rice. This breakage is so great that the Louisiana growers begged for assistance, and the new Office of Plant Introduction sent Dr S. A. Knapp to Japan in search of a short-kerneled variety that would not break in the milling process. Today Dr Knapp declares that one-half of all the rice grown in Louisiana and Texas is the Kiushu rice that had its origin in the introduction made in 1899. This new rice has reduced the breakage from 40 per cent to 10 per cent, and has at the same time brought into culture a more productive rice. It has not done away with the pernicious practice of polishing, but an interest in the unpolished rice has lately been aroused that, it is hoped, will lead to the abandonment of a practice which robs the buyer of nearly all of the flavoring matter of the rice and leaves only the starchy portion. It is a disgrace that the most intelligent nation in the world should be so ignorant of the food value of the crop, on which more people live than on any other, that they should insist upon having their rice made as shiny as polished glass beads, although in so doing they are throwing away the best part of it. No rice-eating people treat their rice as we do, and it is to be hoped that the small markets that have been started for the unpolished rice in this city and elsewhere will lead to a general propaganda in its favor.

THE CORSICAN CITRON INDUSTRY

The Corsican citron is better known to housewives than to the general public, though a failure to put thin shavings of candied citron rind into the poundcake would be quickly noticed by the household.

Though no one person eats in a year any large amount of citron, yet every one eats a little, and the aggregate amounts to over 2,000,000 pounds a year, almost all of which is imported from Italy and Corsica. To assist a progressive Californian who thought he had the right kind of land and a climate in which to grow the Corsican citron, the writer was sent to the birthplace of Napoleon by the pomologist of the department in 1894. It was the first time I had ever tried to get from a foreign people the plants with which to start an industry that would eventually remove one of its best buyers from the field and might some time lead to the appearance of a rival industry. I was nervous and had been advised that the Corsicans were not inclined to let scions of their fine citron trees go out of the country; so on landing at Bastia, the the port nearest Italy, I pushed through to the center of the island; and there, in a small mountain town, perched on one of the characteristic pinnacles of land, surrounded by groves of citron, I made my mission known to the mayor.

While waiting for him to bury one of his friends in a neighboring village I strolled about the place and sought by means of my camera to dispel the suspicions of the crowd that gathered uncomfortably about me. While I stood with my head under the black focusing cloth, with a young mother and her child posing against the stucco wall before me, I was startled by the touch, not too gentle, either, of the *guarde civile* of the village. *"Vos papiers, si'l vous plait,"* was the curt demand. I replied in Italian that I had left them at Bastia, at which response, and to the evident delight of the crowd, I was marched off to jail. On an errand that was not likely to be pleasing if explained to the guard, with no papers in my pocket, with a captor whose very look was enough to terrify any one, and in a jail that would rival in filthiness any that the Inquisition ever had, I think there are few men who would not have paled. Seated in the jail, with the guard and his wicked-looking wife glaring at me, I was asked to give an account of the reason of my visit. This I refused to do, but endeavored to find out why an American was arrested for taking pictures of the beauties of this lovely village. To my surprise I found that I was

1. A Field of Spineless Cactus in Tunis. Planted for fodder. See page 194
2. A Camel browsing off the Spineless Cactus of Tripoli
3. An Orchard of the Carob in full bearing in Spain. See page 190
4. The Spineless Cactus of Tunis
5. The Egyptian Papyrus. Most beautiful of water plants for Florida streams

1. The Short-kernelled Japanese Rice that does not break in milling. See page 184
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3. A Japanese Colonist in his Field of Japan Rice in Texas
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5. A Bamboo Timber Yard in Japan. See page 199
6. A Clump of the Giant Bamboo in Natal, South Africa
7. Trees of the East Indian Mango. The noted Bombay variety. See page 187

taken for an Italian spy, and the examination of all my belongings only served to increase the suspicion, for it revealed Italian notes on abstruse botanical subjects. For hours I fought in poor Italian for a release, but not until I found, in a pocket that had been overlooked, a Treasury check for some small amount, and insisted that this was my paper of citizenship, did the guard reluctantly let me go, and I left the town as quickly as I could, cutting from some citron trees as I went, however, enough scions or bud sticks to graft a small orchard.

It was my pleasure, ten years after this, to visit in southern California the orchard that was the result of the introduction of these scions. The industry is on a paying basis today, and Dr Westlake, of Duarte, has his own factory in which he candies a grade of citron that he claims is more digestible than any now sold on our markets.

UDO, A NEW JAPANESE SALAD PLANT

While there is nothing that has been found yet that will compare with lettuce as a salad plant, the Japanese have a vegetable that will give a welcome variety. In Japan it is as common as celery is with us, and is so popular that it is canned and sent to this country for the use of the thousands of Japanese who live here. It is used cooked with Soy sauce and in many other ways, but it might never have been introduced into America but for the fact that a young American girl, Miss Fanny Eldredge, adopted the thick, blanched shoots, two feet long or more, as a salad. By shaving them into long, thin shavings, and serving with a French dressing, she produced a salad with a distinct flavor of its own, a crispness that was unusual, and a pretty silvery appearance. It was found to be a most vigorous grower, resembling a soft wooded shrub more than anything. The methods of its culture were worked out, and seeds were obtained and distributed to hundreds of private experimenters scattered from Nova Scotia to California and from Maine to Florida, and the result has been that shoots suitable for the table have been produced in a dozen places, chiefly on the Atlantic coast. It has grown almost if not quite as well in Washington as in Japan, and has shown itself a heavy yielder. Seedlings have in one year produced astonishing masses of roots, from which quantities of the blanched shoots have been grown in a dark chamber or under a mound of earth.

THE TROPICAL MANGO

Many people think they know what mangos taste like because they have eaten some fruit by that name sold in one of the fruit stores of our cities. The fruits that are offered now as mangos are unworthy the name, for they are from worthless seedling trees and are little more than juicy balls of fibers saturated in turpentine, while the oriental mango is a fruit fit to set before a king. It is in fact more richly flavored than a peach and has no more fiber. The trees grow on poor soil and attain an extreme old age. They bear enormous crops of fruit, that make the trees look when in full bearing as though they were covered with a mass of gold.

The first introduction of the East Indian Mulgoba mango was made into Florida by the Office of Pomology in 1889. From the one tree of this early introduction which survived the freeze of 1895 has come the new mango craze that is now at its height among the Florida planters who have suitable soil and no frosts or only slight ones. When this tree, saved from destruction by Prof. Elbridge Gale, of Mangonia, came into fruit it was a revelation to America, to the Western Tropics in fact. From this one tree thousands of grafted trees are now growing in Florida, and it will not be long before the mulgoba is for sale on our markets. To meet the demand for the best mangoes in the world, the office has brought young plants of the best varieties from every region where they are grown, and there

From M. A. Carleton, U, S. Department of Agriculture

A Durum Wheat Field at the New Mexico Experiment Station. See page 182

20,000,000 bushels of this wheat were harvested in the United States in 1905

is now assembled in the green-houses of the department the largest and best selected collection of mangoes in the world. These are being fruited in Florida, and the best will be propagated as rapidly as possible for distribution.

SPANISH HARD-SHELLED ALMONDS

The Sierras of southeastern Spain produce most of the long, slender kernelled almonds which have come so rapidly into favor for salted almonds. California could produce them, as she already grows the poorer kinds, the soft-shelled, coarser-flavored sorts. To get these finer kinds, the famous *Jordan* especially, the writer explored the almond orchards of Malaga and Andalusia, and cut scions or grafting wood from the best trees. Much of this material has been used in California with success, but the *Jordan* flowers too early, and another expedition must be made in search of later flowering kinds from the same region to make the hard-shelled type a success, or else new regions must be found in this country where the *Jordan* will not be caught by the late spring frosts.

BERSEEM, THE EGYPTIAN CLOVER

The greatest annual irrigated forage crop for culture in regions with mild winters is the berseem of the Nile Valley. It is the crop that the Egyptian *fellah,* or peasant, has depended upon for centuries as a soil-improver and as a plant on which to pasture his cattle and other animals of the farm. Planted in the late autumn, it grows so rapidly that before the next June it will yield four cuttings of a most nutritious fodder that may be pastured upon, fed green, or made into hay. No other plant known should be so well suited to grow in those newly opened up, irrigated regions of Arizona and California whenever the settlers learn to grow high-priced annual crops instead of alfalfa, which is the main plant industry in that region now. Berseem will not come into competition with alfalfa, for it is an annual, while alfalfa is a perennial, and therefore not suited to grow in rotation with crops like cotton, melons, or other annuals. The trials so far made with berseem are encouraging, and the plant has seeded at various places in California and acre plots of it have been grown.

THE DATE-PALM INDUSTRY

The transfer from the great deserts of the old world to those of the new of the unique date industry is an accomplishment of which the government may well be proud. It is something that private enterprise would not have undertaken for decades to come, and the name of Mr Walter T. Swingle will be always associated with this new industry. Though the attention of the public was first attracted to the possibilities of growing the foreign date palm in this country through chance seedlings that bore fruit, and through an early introduction of the pomologist of the department, it was the exploration trip of Mr Swingle to the Desert of Sahara in 1899 that first proved the feasibility of starting commercial date plantations in Arizona and California. From the time when the first large shipment of palm suckers reached the Southwest until the present, the Office of Plant Introduction has had an explorer in some one or other of the great date regions of the old world gathering plants for the government plantations. Today the list of introduced varieties numbers over 170, and more than 3,000 palms, large and small, have been imported and planted out. The best sorts from Egyptian oases, selected kinds from the valley of the Tigris, the famous dates of southern Tunis, and even the varieties from uncivilized Beluchistan, have been gathered into what can proudly be called the best collection of date varieties in the world. This search through the deserts of the world has revealed the fact that the dates of our markets are only one or

two kinds of the host of sorts known to the true date eaters, the Arabs, and that those we prize as delicacies are by no means looked upon by the desert-dwellers as their best. The search has brought to light as well the hard, dry date, which Americans do not know at all, and which they will learn to appreciate as a food, just as the Arab has. Already Egyptian and Algerian imported palms have borne and ripened fruit, and many persons in close touch and sympathy with the work have sampled the first fruits of the newly introduced industry.

To all of us who have seen the date palm forests of the old world deserts and who have followed the progress of the experiments in this country, the landscape of the deserts of Arizona and California will not long be thought of without the presence of these stately plants that have so much that is biblical and ancient about them.

THE CAROB TREE OR ST JOHN'S BREAD

No tree of the Mediterranean region is more beautiful than the Italian carrubo, the carob or St John's bread of the English. In Sicily it is under its shade that the tired tourist stops to rest, and in Spain it is the orchards of the algaroba that attract his attention by their dark-green foliage and picturesque form. Few realize that this tree is seldom planted for its shade or for its landscape effect, but for its pods.

These are born in profusion and are most highly prized as fodder. There are carob-sellers in Spain, just as there are barley-buyers here, and these sellers export their carobs to this country in large quantities. The thick brown pods are full of a sweet honey-like fluid that runs out if you break them open. Cattle and horses are exceedingly fond of them, and children eat them, too, even in this land of cheap candies. Their nutritive value is high, so high in fact that a Wisconsin manufacturer makes one of the best calf foods on the market out of them.

The carob has already found a home in our West, and there are fruiting trees near Los Angeles to prove that it has come to stay.

EGYPTIAN COTTON INTRODUCTION

America is the greatest cotton-producing country in the world, but nevertheless over 112,000 bales of cotton were imported from Egypt in 1899. There are distinctly different kinds of this great staple, and the Egyptian cotton supplies a different demand from the so-called upland cotton of this country. It is a variety with a long, very silky and crinkly fiber of a light-brown color, and has been found better than the upland for the manufacture of stockings and underwear and for mixing with silk. It is not the equal of the Seal Island cotton that is grown on the islands off the Atlantic coast, but the area in which the Sea Island varieties can be grown is very limited and the supply is disposed of at fancy prices. It was thought that the Egyptian cotton might be successfully grown in the South, and numerous attempts to introduce it have been made by the department; but while the plants grew well, they proved poor yielders, and their culture has been abandoned, although Dr H. J. Webber has since made a large quantity of hybrids between this Egyptian cotton and the upland sorts and these are more promising.

In the great Colorado River valley, however, which is the American Egypt, and has its dry, mild climate, its irrigation systems, and its long growing season, the Egyptian cotton promises much. There fields of it have been grown that resemble in almost every way the great fields along the Nile, and with the rapid increase in population that is taking place along the Colorado River will come the demand for this, the great money-making crop of Egypt.

ALFALFAS FROM TURKESTAN AND ARABIA

From many standpoints alfalfa is the greatest forage crop in the world, and when its immense money value is considered the importance of a better va-

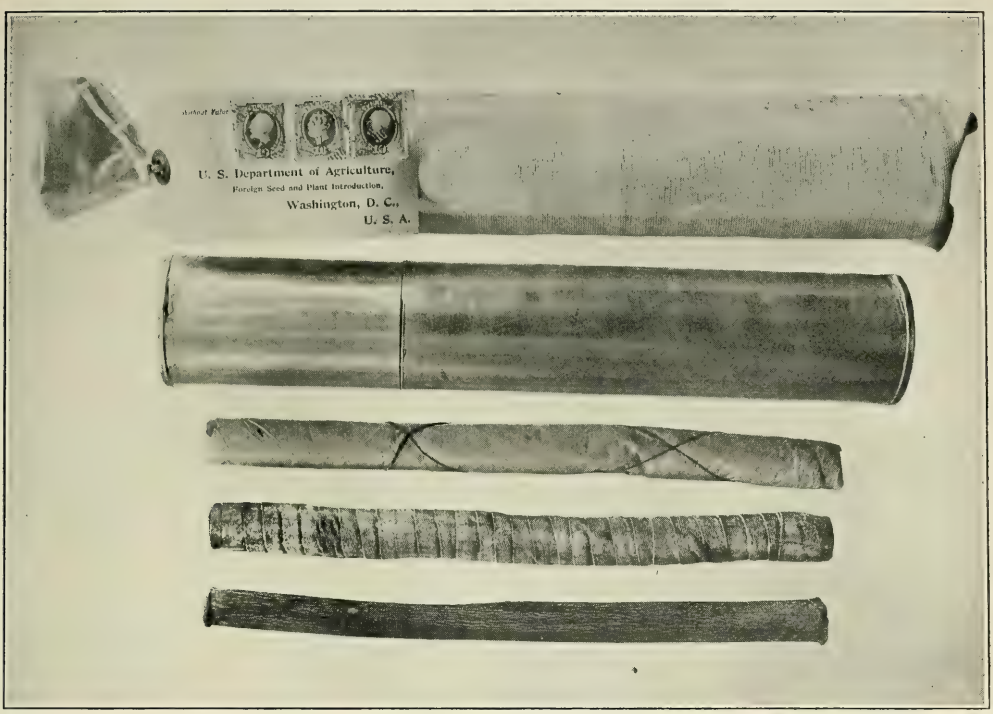


Photo from U. S. Department of Agriculture

A Sample Cutting and the way it is put up and mailed to the Department of Agriculture

riety, that costs no more to grow than the ordinary one, becomes apparent.

It found its way into this country probably from Asia Minor or Arabia through the roundabout way of Chile. Since its introduction by the Friars in the fifties, its culture has spread, until the area covered by it is over 2,000,000 acres.

With the thought that there was no reason why this Chilean alfalfa should be the best in the world, Mr N. E. Hansen, the first explorer of the office, brought home with him seeds of alfalfa which he found on his exploring trip to the steppes of Siberian and Russian Turkestan.

It is only grown there in small patches, that are cut with sickles in a most primitive fashion. Distributed in large amounts, this seed has proven to be of a variety more resistant to drouth and alkali than the ordinary kind, and it is now being grown in acre areas in many parts of the West. While in Arabia three years ago the writer found and imported seed of an alfalfa which the Arab date-growers cultivate, and this has made such an unusual growth in the irrigated regions of the Southwest that the farmers think they can get an extra cutting of hay from it each season.

THE MALIN HORSERADISH FROM BOHEMIA

Horseradish culture in this country has been generally neglected. Until the introduction by the Office of Plant Introduction of the famous Malin horseradish, only one sort, the common American, was known. In a little village near Vienna the best horseradish in the world is grown. There are two or more other

From Gustav Eisen, U. S. Department of Agriculture

Packing Figs in a Smyrna Fig Establishment

Photo from George C. Roeding, of Fresno, California

Distributing Insect-laden Figs in a Smyrna Fig Orchard in order to fertilize the flowers. See page 183

sorts that are recognized in the markets of Europe, but though sold as larger roots, these are not so fine flavored nor so crisp as the *Maliner Kren,* as it is called. The methods of the Malin peasants, too, are superior to those practiced in America, and it was thought at one time that to this difference in method of cultivation rather than to the variety itself was to be attributed its superiority. The introduction of the Malin roots, however, has proven that it is a superior kind. In New Jersey, at Edgewater Park, one of the first men to get the roots grew over six acres this season. Though he had on the same kind of soil, and adjoining the plat where he cultivated the Malin, the American sort, it yielded a ton of roots more than the native kind, was several weeks earlier in coming to maturity, thus commanding a higher figure in the early season, and produced a larger, more regular root. These favorable characters combined have made the Malin horseradish a much better paying one than any other, netting the planter $100 an acre more than the American.

This is a small industry, it is true, but in a single county in that state it has grown from the production of a few hundred pounds a year to that of more than 1,000,000, which means a decided increase in five years in the earning power of a community.

THE MANGOSTEEN FROM THE MALAY ARCHIPELAGO

There is not in the whole range of fruits a single one that surpasses the

tropical mangosteen in delicate flavor or in beauty; and yet, because the West Indies do not grow it, Americans who stay at home cannot taste it. Trees, few in number, it is true, are now grown in Jamaica, Trinidad, and even in Hawaii, but the propaganda in its favor has not yet been made and we are now pushing an investigation to establish it as a new industry in Porto Rico, Hawaii, and on the Panama Canal Zone. The mangosteen has a poor root system and it is one of the lines of research we are following to find among the near relatives of the species a form that has better roots and that will serve as a stock upon which to graft the more delicate mangosteen. The genus to which this wonderful fruit belongs has at least fifteen edible species in it, few, if any, being known to those who have not made them a special study. It has a beautiful white fruit pulp, more delicate than that of a plum, and a flavor that is indescribably delicate and delicious, while its purple brown rind will distinguish it from all other fruits and make it bring fancy prices wherever it is offered for sale.

THE TUNA, A FRUIT AND FODDER PLANT FOR THE DESERTS

The prickly pear, or tuna, is a fruit that all those who have been in Mexico or Italy or who have visited southern Spain have seen and perhaps tasted. Few, probably, have thought that this fruit was the product of a cactus that would grow in the dry deserts where scarcely anything else will live, and produce fruit on which men can live. It furnishes a fodder for cattle, too, that, though not of the best, is at least good enough to make it worth while to cultivate it in the old world, and in the new it has been utilized by burning off the sharp spines. Native in Mexico, but introduced into the Mediterranean region and into South Africa at a very early date, it has developed astonishingly there, and it is from these parts of the world and from Mexico that we are getting for Mr Griffiths, the opuntia expert of the department, all the different varieties. These he is growing in special gardens in California, and it is safe to say that he has already assembled there the largest collections of these plants in the world.

The newspapers have quoted Mr Luther Burbank as claiming to be the originator of the spineless cactus. I do not think that he claims this, but he does think that the so-called spineless forms that the Office of Plant Introduction has brought in are not perfectly spineless, and that he can by breeding and selection remove every vestige of the long spines, and also the almost microscopic spicules that are even more objectionable than the spines, or at least quite as much so.

What some of the possibilities of the opuntia are Mr Spillman, of the Department, has described in a lecture before this Society. The situation is one of the most fascinating in the whole range of plant breeding. Here is a tremendously variable desert plant that can be grown where other plants die; one that can be grown from cuttings as easily as a begonia; one that yields enormous crops of a fruit that is so nutritious that in Tunis, Morocco, and South Africa the natives live on it for months at a time. Though it is so full of seeds that the American fails to appreciate it, it is a fruit of which there are in existence almost entirely seedless varieties from which superior seedless forms can be made; a plant the joints of which are already used for fodder by burning off the spines, making it of value even in the wild state, and of which there are nearly spineless forms now in cultivation in Tunis, Argentina, and southern Spain. Add to this the fact that it is a tremendously rapid grower when given water, and that practically nothing has been done to improve it, and the great possibilities of the plant become apparent.

THE CHAYOTE, A NEGLECTED WINTER VEGETABLE

Unless assisted, it takes a long time for even good vegetables to become

From Z. T. Swingle, U. S. Department of Agriculture

An Arab climbing a Tall Palm in a Garden at Biskra, Algeria, to pollinate the flowers

1. The Mangosteen, queen of the tropical fruits. One-half natural size. See pages 183–184
2. The beginning of the Government's Date Garden in California. See page 189
3. A young imported Mulgoba Mango Tree in Florida. See page 187
4. A basketful of Japanese Loquats as sold in the market of Malta. One of the new fruits of promise
5. A young California Date Palm loaded with fruit

popular. If one could patent them and control the supply, men would take these new things up and push them, just as they have new breakfast foods, of which they can control the processes. But a new vegetable, what man of moderate means wants to spend all the time and money necessary to advertise it, only to find that his neighbor has waited for a market, and when such has been created has gone into the culture of the new vegetable on a big scale and is underselling him?

The chayote is one of many such neglected opportunities. It is a cucumber-like vegetable, borne on a vine which can be trained over a trellis just like a grapevine. It bears large crops of fruit, as many as 500 to the vine. It is a perennial and does not have to be planted every year, as the cucumber does, but goes on for years producing larger and larger crops. The fruit keeps excellently, and as late as March can be sent to the northern markets. Its roots are edible, its young stems as tender as asparagus, while its fruits can be prepared in twenty ways or more. The plant adapts itself to culture under glass and bears fruits there, even in the north, though its natural home is in the West Indies, and it will not be a profitable outdoor culture north of the Carolinas.

With all these points in its favor, which were first called to the attention of the American public by Mr O. F. Cook in a bulletin of the Department, and with the further fact that it has been for years a favorite vegetable among the creoles of New Orleans, there are today none of these vegetables to be had on our northern markets.

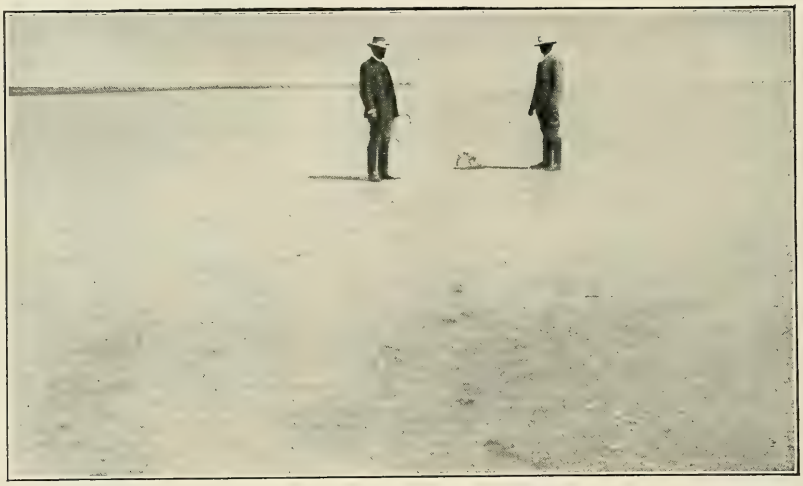
To bring its good points to the attention of those who are looking for new things, the writer introduced it to Managers Hilliard and Macormick, of the Waldorf-Astoria, and the Bellevue-Stratford hotels. These men, whose business it is to cater to the jaded appetites of the rich, have pronounced it an excellent thing, have invented new recipes for cooking it, and have put it for the first time on their menus.

If a small demand is once created in our great cities for this new vegetable, that tastes like a combination of a delicate cucumber and a squash, with more firmness than either, there will be created a new industry for the South that will grow as the tomato industry has grown and support people by its yearly earnings.

PLANT PROBLEMS NOW IN PROCESS OF SOLUTION

The work of Plant Introduction is not theoretical, but practical in character. Its operations are carried on in those places where it is needed, and the problems are suggested by practical men. Some of the problems which the department is now working on are: the finding of paying crops for the abandoned rice farms of the Carolinas; the securing of some profitable plant culture for the unemployed hilly regions of North Carolina and Georgia; the improvement of the brewing barleys of the country; the fitting in of new crops into the arctic agriculture of Alaska; the starting of new industries in our tropical possessions; the increasing of the fertility of the California orchard soils; the introducing of hardy fruits into the Northwest; the substituting of a valuable for a worthless cane in the cane brakes of the South, and the exploiting of a drouth-resistant nut plant for California.

The planters of the Carolinas must have a new crop to grow on the rich rice lands that are no longer profitable for rice culture since the great Louisiana and Texas rice fields have been opened up. The Office of Plant Introduction has suggested the trial of the Japanese matting rush as one likely to be a profitable one on these areas, and is planting thousands of seedlings of the plant, and watching them carefully to see how expensive their cultivation will be. It is also experimenting with a new root crop on the cheap sandy lands of the region as a possible substitute for the Irish potato, which will not grow on that soil.



Original appearance of Salt Lands

There are also thousands of unemployed acres of hilly lands in the Carolinas where the conditions are good for the culture of the Japanese plant from which the finest writing paper in the world is made, and the Office has introduced and planted there thousands of these plants to see if they will not develop into an industry which will utilize these great waste areas.

The barley-growers of the country are growing millions of bushels of grain for the brewers, but among the hosts of so-called varieties that are recognized on the grain markets not one is a pure race or breed. The Swedes have long since found the use of pure barleys of great advantage to the brewers, and their plant-breeders have created pure types. The Department has imported these, and they are now on extensive trial by the best barley-growers in the country.

Alaska, with its cool, short summers and extremely cold, long winters, offers new problems for Plant Introduction. The crops cultivated by the farmers of the great plains are accustomed to a long, hot summer, and when tried in Alaska they are caught by the early autumn frosts before they are half ripe. To meet these new conditions, Norway, Sweden, and Finland have been drawn upon for grains and vegetables, and the most successful oats grown in Alaska today are the Finnish black oats that were introduced by the Office of Plant Introduction.

For the tropical regions of Porto Rico, Hawaii, the Philippines, and the Panama Canal Zone, there are hosts of new possibilities open. The sisal fiber importations from Mexico cost this country over $16,000,000 a year, and we propose to demonstrate on a practical scale that the sisal plant will grow in Porto Rico and supply a share, at least, of the thousands of miles of binding twine which the Western farmers use in their harvest fields.

There are a host of new fruits which are common in the oriental tropics and which would quickly win their way to popular favor on our markets, waiting to be brought in and made into thriving industries. The run-down coffee varieties need new strains to invigorate them, and it is a possibility that the wild coffees of Abyssinia which Consul Skinner has secured for the Department will bring this about. There are new root crops like the taro, the yautia, and

Appearance of the same Salt Lands two years after planting of Berseem

the tropical yam that are almost unexplored, so far as their possibilities as food for the white man are concerned, and whose excellent qualities and remarkable yields put them in the same rank with the potato.

THE CURIOUS PROPERTIES OF THE FENUGREEK

The great fruit-growers of the Pacific slope, with their thousands of acres of clean-tilled orchards, have been searching for a cover crop that would increase the fertility of their lands and add the necessary humus or vegetable matter to it. We have found this for them in the shape of a leguminous plant that inhabits the Mediterranean region—the fenugreek. The seeds of this plant, curiously enough, are eaten by the Jewish women of Tunis in order to make them fat, and no young Jew in that region would think of marrying a girl until the use of this grain had increased her weight to the fashionable figure of 250 or 300 pounds. The seeds form a part of the expensive condition powders that stockmen use to prepare their stock for the fat-stock shows, and it was for this purpose that our explorers introduced it in the first place.

For the great Northwest, where fruit trees are killed every winter and none but the hardiest kinds will grow, the explorers have brought in from Russia the hardy Vladimir cherry and forms of the Siberian crab-apple, with the hope of at least starting some types of fruit that will be hardy there.

The "cane brakes" of the Southern States are thickets of an American bamboo whose stems are so brittle that they are worthless in the arts. Shipments of the Japanese timber bamboo, from which the thousand and one beautiful Japanese things are made, have been imported and are being tried in those areas to see if they will not grow there and occupy land that today is the ranging ground of wild hogs and half-wild cattle.

A DROUTH RESISTANT NUT

Thousands of acres of almond orchards in California have been unprofitable because the rainfall is too light in the regions where the orchards have been started; and to get a more drouth-resistant nut plant for these areas the pistache from the Levant has been brought in, and there are now being set out at various places in California small

1. A Wagon Rain Covering, four years old, made of Mitsumata paper, and oiled with Perilla oil. See page 198
2. A Hillside in Japan covered with the Mitsumata Paper Plant
3. Camel loads of Berseem entering Cairo in the early morning. See page 189
4. Century old Olive Orchards in the island of Zante, Greece

pistache orchards, the pioneers of the new pistache industry, that will some day make this delicious nut as common as the almond is, not as a coloring and flavoring material for ice creams, but as a nut for the table, to serve as salted almonds are now. Mr Swingle, the enthusiastic introducer of this nut, has searched throughout the world for all the pistache species that can be found, some to use as stocks and others to breed from, and there is every prospect that he will succeed in introducing into the arid regions of the Southwest an entirely new nut industry.

These are some of the many problems that the government enterprise of Plant Introduction is engaged in solving.

They are problems that private enterprise will not naturally undertake; they are problems that concern the wealth-producing power of American soil; they are problems that the government has shown its ability to solve in a manner involving an insignificant outlay of the public funds. They encourage the production of food and other products that we now import from other lands, and they concern the establishment of farm industries which, for generations to come, will support hundreds of thousands, perhaps millions, of American citizens.

MODERN TRANSMUTATION OF THE ELEMENTS*

By Sir William Ramsay

THE story of helium is perhaps one of the most romantic in the history of science; and it is a story of which the last chapters are still unwritten. Originally seen as a spectrum line in the chromosphere of the sun, it was discovered on the earth twenty-eight years later; and it has provided the first authentic case of transmutation—a problem which occupied the alchemists from the sixth century.

On August 18, 1868, an eclipse of the sun was visible in India. Among those who observed it was the celebrated French astronomer Janssen, and for the first time a spectroscope was employed to analyze and trace to its sources the light evolved by the edge or "limb" of the sun. It appeared that enormous prominences, moving at an almost incredible rate, were due to hurricanes of hydrogen. That the gas blown out beyond the shadow of the moon was really hydrogen was revealed by the red, blue-green, and violet lines which characterize its spectrum. Among these lines was one occupying nearly the position of the two lines characteristic of the spectrum of glowing sodium, named D^1 and D^2 by Fraunhofer; and this third line was characterized as D^3 by Janssen. On October 20, 1868, Sir Norman Lockyer, in a note presented to the Royal Society by Dr Sharpey, mentioned that he had "established the existence of three bright lines" in the "chromosphere," a word suggested by Sharpey to denote the colored atmosphere surrounding the sun; one of these was "near D." It was known that an increase of pressure had the effect of broadening spectrum lines; and Frankland and Sir Norman Lockyer were at first inclined to attribute this new line to a broadening of the sodium lines, owing to the pressure of the uprush of gas, causing the hurricane. However, neither this hypothesis nor a subsequent one, that

* From the Athenæum.

the new yellow line might possibly be ascribed to hydrogen, could be maintained; and hence the line was attributed to the existence of an element in the sun unknown on the earth, and the name "helium" was chosen as an appropriate reminder of the habitat of the element.

Among the lines visible in the chromosphere ten are always observed. Of these four may be seen in the hydrogen spectrum, one is due to calcium and four to helium; there is still one unidentified with the spectrum of any known element; it has the wave length 5316.87, and the source has been named "coronium." It appears at a great height in the solar atmosphere, and it is conjectured that it must be lighter than any known gas.

Shortly after the discovery of argon, in 1884, the notice of one of the discoverers was drawn to an account by Dr Hillebrand, of the United States Geological Survey, of the presence in certain ores containing uranium of a gas which could be extracted by an air pump. Hillebrand examined the spectrum of the gas and supposed it to be nitrogen. It is true that he saw in it spectrum lines which could hardly be ascribed to nitrogen; but on mentioning the fact to his colleagues he was bantered out of his quest and did not follow up the clue. Now, in the spring of 1895 attempts were being made to cause argon to combine, and it was argued that conceivably Hillebrand's gas might turn out to be argon and might give an indication to a possible compound. Consequently a specimen of clevite—one of the minerals which Hillebrand had found to give off the supposed nitrogen in largest quantity—was purchased and the gas was collected from it. On purification its spectrum showed the presence of a brilliant yellow line almost identical in position with the yellow lines of sodium. It was soon evident that the solar gas, helium, had been discovered on the earth.

The visible spectrum of helium is comparatively simple, and many of its lines have been identified among those of the solar chromosphere. It is also to be detected in many of the fixed stars, notably Capella, Arcturus, Pollux, Sirius, and Vega. It is one of the lightest of gases, being only twice as heavy as hydrogen, but unlike hydrogen, however, its molecules consist of single atoms, whereas those of hydrogen consist of paired atoms, which separate only when hydrogen enters into combination with oxygen or other elements. This peculiarity appears to render liquefaction of helium almost impossible; for while hydrogen has been liquefied and boils at 422 degrees Fahrenheit below zero, helium has been cooled to —438 degrees Fahrenheit and has been compressed to one-sixtieth of its ordinary bulk, and yet has shown no sign of liquefaction. Indeed, it is now the only "permanent" gas, for it has never been condensed into liquid form.

The minerals which contain helium have one thing in common: they all contain uranium, or thorium, or lead, or a mixture of these. Minerals of lead alone do not show the presence of helium; but it may be stated that helium is an invariable constituent of ores of uranium and thorium. It was at first supposed that such minerals contain helium in a state of combination; but this view could not be substantiated, for the constituents of these ores do not show any tendency toward combination with helium. The connection of this with what follows is very remarkable.

The explanation of the fact that compounds of radium discovered by Madame Curie in 1901 are permanently at a temperature considerably above that of the atmosphere, and that they are continually emitting corpuscules of high velocity, was given by Professor Rutherford and Mr Frederick Soddy in a series of papers communicated to the *Philosophical Magazine*. It is that radium and allied bodies are "disintegrating"—that their atoms are spontaneously flying to bits. Now, this view, although new in its application to elements, has long been known to hold for certain compounds. There is a fearfully explosive compound of nitrogen with chlorine, which on the least touch

resolves itself suddenly into its constituent elements. It is true that here we have a molecule composed of atoms "disintegrating" into atoms which subsequently combine to form new molecules of nitrogen and of chlorine; but in principle an analogy may be drawn between the disruption of the molecules of an explosive compound and the disintegration of an atom into corpuscules. Professor Rutherford and Mr Soddy showed, however, that corpuscules which have been proved by Professor J. J. Thomson, of Cambridge, to be exceedingly minute are not the only products of disintegration of the radium atom; the proof was adduced that among these products were atoms of a density comparable with that of hydrogen and helium. This hypothesis evidently admitted of experimental proof, and in conjunction with Mr Soddy I collected the "emanation" or gas evolved from salts of radium. We showed that this gas, presumably of high density, disintegrates in its turn, and that perhaps 7 per cent of it changes into helium. What becomes of the remaining 93 per cent is as yet undecided; still, some hint may be gained from the fact that a constant ratio exists between the amount of helium obtainable from a mineral and the weight of lead which it contains. It may be that lead forms the ultimate product, or at least one of the ultimate products, of the disintegration of the atom of emanation. Another radioactive element, actinium, has been shown by its discoverer, Debierne, also to yield helium by the disintegration of the emanation or gas which it continuously evolves.

This disruptive change is attended by a great evolution of heat; for the radioctive elements are in a sense explosive, and explosions are always accompanied by a rise of temperature. But such atomic explosions surpass in degree, to an almost inconceivable extent, the molecular explosions with which we are familiar. Could we induce a fragment of radium to evolve all its energy at once, the result would be terrific, for in the energy with which it parts during its change it surpasses in explosive power our most potent guncotton by millions of times. It has been suggested that to this or similar changes are due the continued high temperature of the sun and the presence of helium in its chromosphere.

Up to the present no further cases of transmutation have been observed than those mentioned—radium and actinium into their emanation, and these emanations into helium. But proof is accumulating that many forms of matter with which we are familiar are also undergoing similar change, but at a vastly slower rate. "The mills of God grind slowly"—so slowly that many generations of men must come and go before ocular proof is obtained of the products of such possible transmutations.

BRAZIL AND PERU

THE enthusiasm with which Brazil and the other republics of South America are preparing for the Pan-American Congress at Rio de Janeiro this summer well illustrates the commercial prosperity and the political permanence which practically the entire continent is now enjoying.

Brazil began the twentieth century with 17,000,000 people, a territory larger than that of the United States, and undeveloped resources surpassed by no country with the possible exception of the United States and China. Consul Seeger writes as follows:

Of all the South American countries Brazil is the most extensive. It contains an area of 3,200,000 square miles, is 2,630 miles long, 2,540 miles wide, and has a population of 17,000,000, mostly of Indian origin. It borders on every country of South America except Chile.

The rivers are numerous, among the largest being the Amazon, Madeira, Negro, Para, Tocantius, Parana, and San Francisco. In the extreme northern part of the country are the llanos, or grassy plains, on which roam millions of horses, many being caught and sold in the different markets of the world. Central Brazil, especially that part lying contiguous to the Amazon and its tributaries, is called the silva, or forest region; it abounds in Para rubber and palm trees, mahogany, and dyewoods. The eastern and southern parts form the great Brazilian plateau. On account of the climatic conditions and the fertility of the soil, this section is especially adapted to the cultivation of the coffee tree, the production of sugar, cotton, tobacco, rice, and fruits. Among the minerals, besides gold and diamonds, iron of superior quality is abundant. The emerald, ruby, topaz, sapphire, garnet, and other precious stones are found in considerable quantities. Quite large quantities of corn and wheat are grown in the Amazon basin, but none for export.

Brazil is a country of varied and wonderful resources, and with the introduction of up-to-date methods its development could be extended so that within a few years it would produce enormously and take high rank among the leading commercial countries of the world. The export trade is increasing at a very rapid rate, especially in that of rubber, which amounts to millions of dollars annually. The introduction of the bicycle, automobile, and other rubber-tired vehicles has given the rubber production an impetus that has caused it to forge to the front as the leading export of the country. The coffee trade is being extended and has a very healthy growth. The United States buys 50 per cent of the coffee exported, which amounted to $46,922,974 during the year ended June 30, 1904.

Of the three leading countries that sold their products to Brazil in 1904, Great Britain ranks first, with $34,976,266, or 28 per cent of the total amount; Germany second, with $15,975,118, or 12 per cent; the United States, $14,041,970, or 11 per cent. The great disparity in the amount of goods sold by Great Britain and the United States to Brazil presents a problem that must be studied by the manufacturers and exporters of this country if their trade with that and the other South American countries is to be extended.

In recent years a large amount of foreign capital has been invested in Brazilian enterprises, especially in the city of Rio de Janeiro, Sao Paulo, and in the southern states. German capitalists have established steamship lines for coast service, and American and Canadian capitalists have acquired the car lines, gas works, and telephone service at Rio de Janeiro, the money invested being estimated at $25,000,000.

NAVIGATION RETURNS

During the year 1904 there entered at the several ports of Brazil 17,407 steamers and sailing vessels, of 11,879,563 tons, being an increase of 1,339 in number of vessels and 811,265 in tonnage. Of these 13,452 vessels or 4,589,544 tons were Brazilian, 1,792 or 3,661,010 tons were British; 737 or 1,730,375 tons were German; 392 or 829,526 tons were French; 168 or 363,301 tons were Argentine, and practically none from the United States.

The American Consul General at Callao, Peru, Mr Gottschalk, writes that a Peruvian loan of $14,610,000 gold has been awarded to the German Transatlantic Bank of Lima, as the representative of the Deutscher Bank of Berlin. Peru is to issue bonds for the loan at 98½ net, bearing interest at 7 per cent. One per cent of this will be devoted to canceling the debt. The award was made after the offers were carefully considered from a London bank, a Paris bank, two New York banking firms, and the German institution. The people are elated over the favorable terms, which, joined to the fact that a former loan was also taken up by Germany, greatly strengthens the prestige of the local German bank and German commercial prestige throughout Peru.

WALTER WELLMAN'S EXPEDITION TO THE NORTH POLE

AT a meeting of the Board of Managers of the National Geographic Society on March 16, 1906, President Willis L. Moore in the chair, the following resolution, moved by Dr Alexander Graham Bell and seconded by Rear Admiral Colby M. Chester, U. S. N., was unanimously adopted:

"*Resolved,* That it is the sense of the Board that the plans outlined by Mr Walter Wellman for reaching the North Pole are carefully and thoroughly considered, and give good promise of success;

"That the Board heartily approves of these plans, and will do everything in its power to aid in carrying them out;

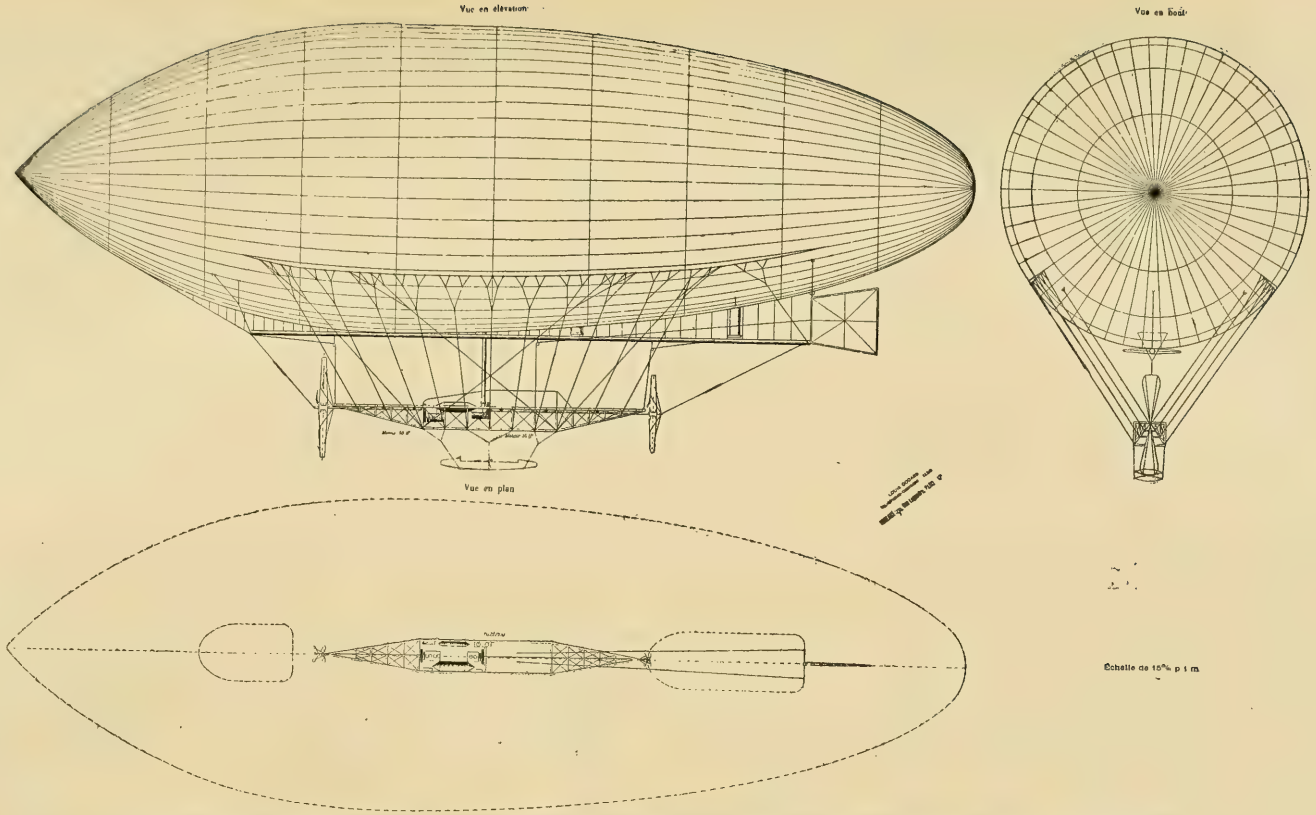
"That the Board accepts Mr Wellman's proposition to send a scientific representative, and will, as far as possible, see that such representative is equipped for the work involved."

Major Henry E. Hersey has been appointed the representative of the National Geographic Society to accompany Mr Wellman, and the scientific program is now being arranged by the Research Committee of the Society, consisting of Vice-President Henry Gannett, Chairman; C. Hart Merriam, F. V. Coville, A. J. Henry, O. H. Tittmann, C. W. Hayes, L. A. Bauer, W. H. Holmes, O. P. Austin, and C. M. Chester.

When the Spanish-American war began, Major Hersey was in charge of the climate and crop work of the U. S. Weather Bureau in Arizona. He obtained leave of absence, raised a regiment, and offered his services to the government. Only part of the regiment was needed, so that Major Hersey was transferred as captain to the Rough Riders, of which he was the ranking major when the war closed. Since then he has been connected with the U. S. Weather Bureau. Probably two additional men will accompany Mr Wellman and Major Hersey in the airship voyage.

The first announcement that Mr Wellman would attempt to reach the North Pole in an airship was made on December 31, 1905. Mr Victor Lawson, the principal owner of the *Chicago-Record Herald* and a life member of the National Geographic Society, supplies the money. His public spirit and generosity in thus supporting an expedition which will probably cost more than $250,000 before it is completed is deserving of the highest respect and appreciation. The expedition has been incorporated under the laws of Maine, with Mr Lawson, president; Mr Frank B. Noyes, editor of the *Chicago-Record Herald,* treasurer, and Mr Wellman, general manager. The plans of the airship were determined after much deliberation with the leading experts in aeronautics of France.

Among Mr Wellman's advisers were Alberto Santos-Dumont; the engineer, Henri Julliot, who built the Lebaudy dirigible and who has just been accorded the grand cross of the Legion or Honor; Commandant Renard, of the army, representative of the distinguished family whose names are famous in the history of aerial navigation; Commandant Bouttiaux, chief of the army aerostatic station at Meudon; Captain Voyer, assistant chief and a man of great experience in aeronautics and with dirigibles; M. Goupil, well known mathematician, the greatest authority in France on aerial screws, engineer, and chevalier of the Legion of Honor; Captain Ferber, an expert not only in aeronautics, but in aviation; M. Edouard Surcouf, a well-known constructor and engineer, who is now building a dirigible for M. Deustch (de la Meurthe); M. Louis Godard, the aeronaut and constructor who has built scores of ships of the air and who has



General Features of the Plans for the Airship of the Wellman Chicago Record-Herald Polar Expedition

Engineer Louis Godard's plan, printed above, shows the proportions and in part the details of the greatest airship ever constructed. The dimensions of the huge balloon are as follows:

	Meters	Feet
Length	50	164.04
Greatest diameter	16	52.49
Surface	1,960 sq.	21,098 sq.
Volume	6,350 cube	224,244 cube

	Kilos	Pounds
Lifting power (hydrogen at 1k., 110 per meter cube)	7,048	15,538
Lifting power (hydrogen at 1k., 140 per meter cube)	7,240	16,000
Weight of airship, steel car, motors, and machinery, complete	3,000	6,600
Weight of crew, instruments, wireless and other apparatus, gasoline	4,240	9,400

Duration of inflation, 15 to 20 days.

The motive power is composed of two motors, one of 50 and the other of 25 horsepower, driving two screws, and giving speeds of from 12 to 15 statute miles per hour.

The length of the car, which is made entirely of steel tubing, is 16 meters, or 52.5 feet.

The engine-room and cabin for the crew are inclosed.

The steel boat is carried suspended below the car.

This boat serves as a working deck for the manipulation of the guide-rope equilibreur and retardateur, and also for storage of gasoline. In case any accident happens to the airship it is to be used by the members of the crew in sledging their way back to the headquarters.

made 500 ascensions; the engineer and mathematician, Andre, who is M. Godard's scientific collaborator; Gaston Hervieu, an engineer and aeronaut, who is also an expert mechanic; Alexandre Liwenthaal, who was associated with Count Zeppelin in the famous airship experiments in Germany and Switzerland, and others.

Mr Wellman gave to M. Godard the contract for the construction of the great airship, and the work is now under way. The aeronef is to be completed in May. All its motors, propulseurs, and mechanical parts are to be thoroughly tested in Paris. In June all the paraphernalia of the expedition is to be assembled at Tromsoe, Norway, where the ice steamer *Frithjof* is lying—a craft well known in Arctic annals, having been used by the Wellman expedition to Franz Josef Land in 1898, and employed later by the Ziegler expedition.

About June 20 the *Frithjof* will sail for Spitzbergen, and Mr Wellman expects to establish his headquarters at Low Island, North Spitzbergen, latitude 80° 20′, about July 1. The party will at once proceed with the erection of headquarters buildings, a huge shed large enough to hold the airship when inflated, gas apparatus, etc. An idea of the large scale upon which the expedition is organized may be gained from the fact that at the headquarters will be assembled about 35 men, including the scientific staff, engineers, aeronauts, mechanics, sailors, and workmen. To make the hydrogen for inflation of the airship 105 tons of sulphuric acid and 75 tons of iron filings are taken. During the latter part of July the airship is to have its trials under meteorological and other conditions almost identical with those which prevail along the route to the Pole.

The expedition has announced a two-years' campaign for the Pole, and has chartered the *Frithjof* for the seasons of 1906 and 1907. If upon being carefully tested the dirigible is found to be in fit condition for the voyage, an effort to reach the Pole will be made this year. If not, the flight over the Arctic Ocean will be deferred till next year, as Mr Wellman has announced that he will not start till all his equipment is in the best possible order, whether it be this year or next. If the final attempt goes over to 1907, the party will return in the autumn and spend the winter and spring reconstructing the airship in the light of the summer's experience, improving and strengthening it, and, if necessary, building an entirely new aeronef.

An interesting feature of the expedition is the plan to maintain wireless communication between the Arctic regions and the outer world. Wireless station number 1 will be established at Hammerfest, Norway, in touch with the Atlantic cable. Station number 2 will be at the expedition headquarters in Spitzbergen, and it is expected that constant communication between these points, 600 miles apart, can be maintained. Station number 3 will be on the airship, and it is believed that messages can be sent from the neighborhood of the Pole itself to the headquarters at Spitzbergen, and thence to Hammerfest, in case the expedition should be fortunate enough to reach the vicinity of the Pole.

The period of the whole trip by dirigible is assumed at 10 days, or 240 hours. Mr Wellman believes the airship can be kept in the air as long as 20, possibly 25, days, because the loss of ascensional force should not be more than 200 pounds per day through leakage of gas, or say 5,000 pounds in 25 days, while in that time he expects to burn 5,500 pounds of gasoline in the motors, thus lightening the load by this much, not counting the provisions consumed, etc. He carries gasoline enough for about 140 hours of motoring at approximately 12 miles per hour. Hence each assumed period of 10 days is divided into 140 hours motoring and 100 hours drifting with the retardateur.

THE POLAR AIRSHIP

By Walter Wellman

AIRSHIP construction and operation is an art which has not made much progress in this country, although Knabenshue, Baldwin, and perhaps others have done interesting and valuable work on a small scale. In this country the prevailing conception of an airship is that of a gas bag of small size, relatively, covered with a netting of ropes or steel wires, and with sufficient lifting capacity, when inflated with hydrogen gas, to carry the balloon, a light framework of bamboo or wood, one or two men, and a small motor, with a sufficient supply of fuel to run it for a few hours.

The dirigible which M. Godard and his corps of experts have in hand is an entirely different sort of affair. Its great size enables it to lift not only the balloon, but the car of steel, the three motors, comprising a total of eighty horsepower, two screws or propulseurs, a steel boat, moto-sledges, five men, food for them for seventy-five days, instruments, tools, repair materials, lubricating oils, and 5,500 pounds of gasoline for the motors. It will be seen that in its cargo capacity our ship of the air, with its eight tons of carrying power, much more resembles a vessel to navigate the water than the small contrivances used by Santos-Dumont, Knabenshue, and Baldwin in aerial experimentation.

The instructions given by me to M. Godard, and embodied in the contract, were to spare neither weight nor expense in his efforts to make a balloon that should give the maximum of security and endurance. It is commonly believed among the aeronautic experts of France that the unfortunate Andree met his fate partly through faulty construction of his balloon; that it lacked the gas-tightness which should have enabled it to remain a long time in the air, and that the fabric of which it was composed did not possess sufficient tensile strength to enable it to resist the elements and give its navigators a fair chance for their lives. I pass no judgment as to this, because I believe the builder of Andree's balloon, who is now dead, was a careful and conscientious man. But, at any rate, I was determined to avoid such mistakes if care and prudence and outlay could suffice to do it. For in one particular, and in one only, speaking broadly, is our enterprise comparable to that of Andree—the solidity and endurance of the gas-bag is as essential to us as it was to him, despite the fact that his aerial craft was a mere toy of the winds, without motive power or steerability, while ours is to have both.

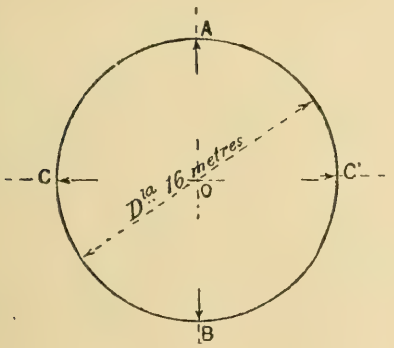
THE MATERIAL USED

In the past most balloons have been made of silk, varnished with from two to five coatings; but in recent constructions of important character cotton tissues have been employed, in one or more thicknesses, coated with a thin film of pure rubber applied by means of special machinery similar to the calenders of paper mills. The Lebaudy airship had two tissues of this cotton, both rubbered. After careful consideration and elaborate calculations of pressures and strains, three thicknesses of fabric were decided upon for our ship—two of cotton material and one of silk—with three coatings of rubber. All three are consolidated into one fabric, giving great tensile strength. Counting from the interior of the balloon, the envelope is made up as follows:

	Grammes per sq. meter.	Ounces per sq. foot.
Strong silk	85	.278
Caoutchouc (Para pure)	105	.344
Cotton	105	.344
Caoutchouc	65	.213
Cotton	100	.328
Caoutchouc	45	.147
Total	505	1.654

In the central zone embracing the "maitre couple," or greatest diameter, the pressure of the gas rises to 466 kilos per square meter, equal to about 95 pounds per square foot. It is upon this central zone the envelope is applied as outlined above—one strong silk and two thicknesses of cotton, with three coats of rubber. These three thicknesses of material, consolidated into one, give a total tensile strength of 2,800 kilos per square meter, or about 575 pounds per square foot. Hence we have this result: Maximum strain, 95 pounds per square foot; tensile strength, 575 pounds per square foot; coefficient of safety, 6 to 1.

In the next zones the pressure ranges from 315 to 450 kilos per square meter. With a maximum of 450 kilos to pro-



vide for, a lighter silk is used in these zones, reducing the weight of the envelope to 455 grammes per square meter, but retaining 2,400 kilos of tensile strength, which means a coefficient of more than 5 to 1.

In the outer sections the maximum pressure is 350 kilos, and here the envelope is composed of two thicknesses of cotton with three coatings of rubber, omitting the silk, and again saving in weight, but securing 1,800 kilos of strength per square meter—again with a coefficient of safety of more than 5 to 1.

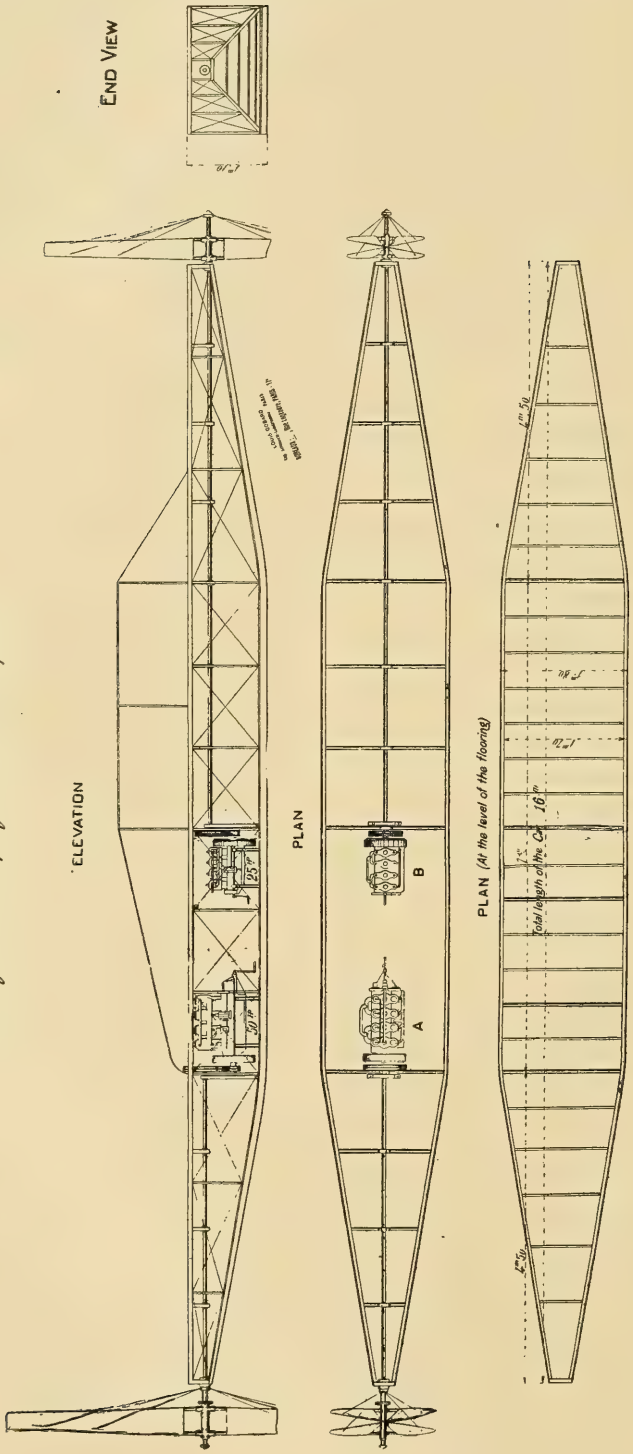
THE TENSILE STRENGTH

In the Lebaudy airship the coefficient of safety was 3½ to 1. We have a coefficient of more than 5 to 1 throughout.

The tensile strength of the fabrics is not a matter of guesswork. Samples of each consignment from the manufacturer are submitted to the Paris Chamber of Commerce, tested by dynamometer, and officially stamped. These tests are under the regulations of the chamber of commerce, and the certificates are made the bases of contracts and their fulfillment.

In computing the work of the gas upon the fabric of the balloon M. Godard and his engineers have assumed that the interior pressure is equivalent to 30 millimeters of water, or about 6 pounds per square foot. This pressure is maintained by means of the ventilator or blower which inflates with air the balloonet or interior balloon, and which is operated by an independent motor of 5 horsepower in the engine-room. The use of the pressure is to maintain the rigidity of form of the great balloon, as there are no interior frames or other stiffening devices. The integrity of form is maintained solely by interior pressure, and this pressure is usually at 20 to 24 millimeters. In taking 30 millimeters and adding it to the upward thrust or lifting force of the gas itself (somewhat more than one ounce per cubic foot), M. Godard has shown the conservatism which characterizes all his calculations and work. Though it is unlikely the interior pressure within our balloon will ever exceed 25 millimeters, the fabric of the envelope has strength sufficient to give a factor of safety of 5 to 1 at 30 millimeters.

In addition to the tensile strength of the envelope, every seam, whether circumferential or longitudinal, is reinforced. The material is lapped about 25 millimeters (one inch), and doubly sewn. Inasmuch as there is danger that the hydrogen may escape through


END VIEW
ELEVATION
PLAN
PLAN (At the level of the flooring)
A
B
Total length of the Car 16.m
Car of the Airship of the Polar expedition

the little holes made by the needle, all the sewing lines are covered with bands of fabric cemented to the envelope—first a band covering the seam, and over that still another and wider one. The primary purpose of these interior bands is to make the envelope as nearly as possible gas-tight, but they also add greatly to the tensile strength of the skin.

The outer surface of the balloon is quite smooth. There is no netting of cordage or of wires to hold moisture, snow, or frost. Besides, the outer surface is a coating of rubber, which will serve to shed the rain and snow and prevent moisture entering the fabric. In effect the double reinforcing bands which cover the seams, circumferentially and longitudinally, act as an interior netting, consolidated with the envelope, and increasing materially its powers of resistance to all stresses. This added tensile strength is not computed in the coefficient of 5 to 1.

No means has as yet been found of making, with fabrics, an absolutely gas-tight reservoir. In varnished silk balloons, even when of two or three thicknesses of material, the loss ranges from 1½ to 3 per cent daily. With fabrics coated with caoutchouc these losses are materially reduced; and with our threefold material and three coatings of rubber we shall, according to the experts, approximate very closely to gas-tightness. M. Godard's contract calls for an envelope from which the loss by leakage shall not exceed 1½ per cent in 24 hours, and he is convinced the loss will not be more than one-half of his maximum allowance. A loss of even 2 per cent per day would not be great enough to interfere with the plans of the expedition.

THE WEIGHT OF THE BALLOON

The weights of the various materials entering into the construction of the huge balloon will be approximately as follows:

	Pounds.
Fabric of the envelope, and rubber coatings	2,200
Reinforcing bands	225
Etraves and relingues (for suspension of car)	100
Five valves	110
Balloonet of light varnished silk	225
Total	2,860

Allowing for the three thicknesses, for the laps, and for wastage in cutting, approximately 12,000 square yards of fabric will be required. The cost of material is about $1.50 per yard as it comes from the factory.

It is the judgment of all the aeronautic engineers whom I consulted in Paris that M. Godard is constructing for our expedition the strongest and most enduring gas envelope known to the history of the art.

SPEED OF THE BIG AERONEF

When we start in our airship from Spitzbergen for the North Pole—and we entertain hopes of being able to set out in the latter part of next July or the early part of August—we expect to be able to advance at an average rate of about 12 geographical miles per hour; that is to say, this is the mean speed which has been assumed as the basis of our calculations. At one hour it may be greater, at another smaller; but this is the expected average. Of course, in speaking of the speed of a dirigible we always have in mind what the French call its "proper speed"—its speed of its own force in calms, the speed it could make wholly with its own means of propulsion, irrespective of the helping or the hindering of the winds. The effect of the wind upon the movement of an airship, whether in France, in America, or the Arctic regions, is precisely this: The velocity of the wind is to be subtracted from or added to the proper speed of the ship, according as whether the wind is adverse or favorable on the course one is sailing. For example, if an airship is steering northward, with a

speed of 12 miles per hour, by its screws, and a south wind is blowing at 10 miles per hour, the speed of the ship, relative to the earth, will be 22 miles per hour. Conversely, in a north wind of 10 miles per hour, the ship will make but 2 miles per hour.

THE STEEL CAR

In the accompanying illustrations the reader will find the plans of the nacelle, or car, of our dirigible. It is a strong frame of steel tubing, and the end view shows the method of its construction on the truss principle. The length of this nacelle, or car, is 16 meters, or 52.5 feet; width, outside, 1m. .80, or 71 inches; width, inside, 1m. .70, or 67 inches.

The central section of the car is inclosed by means of walls and roof of fabric which is both water- and fireproof. The roof is 2 meters, or 78.5 inches, above the floor. The engine-room is 3 m. .50, or 11.5 feet, in length, and so is the cabin or living room of the crew, which is also to be used as a place to carry instruments and a part of the provisions. One disadvantage in the arrangement of the cabin is that the shaft for the rear propulseur passes directly through it; but it was desired to have all the motors in one engine-room, and hence it was not easy to make a better arrangement.

It will be noticed that the form of this steel car gives it the maximum of strength in proportion to its weight, and that the helices, or propulseurs, and their shafts are emplaced in a staunch manner. The total weight of the steel car, with the inclosure, but without the motors, shafts, screws, or any other machinery, is 330 kilos, or 730 pounds.

One of the most important questions that had to be decided was the power and number of the motors. Should we go in for high speed, or content ourselves with lower speed secured with a relatively smaller expenditure of fuel?

Obviously this involved the whole question of the plan of the campaign, and the conclusion reached might be decisive of the success or failure of the expedition. So it may be easily understood that many days and nights of anxious study were given to this fundamental problem.

NAVIGATING AGAINST THE WINDS

In determination of this problem of the speed the first question that arose was: "Is it practicable to give the airship high enough speed of its own power to enable it to make headway against any winds it is likely to encounter during its voyage to the Pole and back?"

If this question could be answered in the affirmative—we mean in a practical, not merely a theoretical, sense—then manifestly this would be the better method to employ. It would be fine indeed to have at one's command a ship of the air, like a steamship of the ocean, that need not stop its course for any wind that might blow along its course, whether favorable or unfavorable. Obviously the velocities of the winds in the Arctic Ocean in July and August are the criteria to which this phase of the problem must be first referred. Fortunately I had made elaborate studies and analyses of the Arctic winds. From the observations made by the Dr Nansen Expedition in the *Fram* during three years of drift through the North Polar Sea, I had deduced the probabilities of winds for given periods. Turning to these tables of wind means or general probabilities, we found that if the voyage of an aerial craft were to cover a period of 10 days we might expect to encounter winds as follows:

Under 10 miles per hour—140 hours.

From 10 to 17 miles per hour—80 hours.

From 17 to 30 miles per hour—20 hours.

If we could equip ourselves with motors and screws able to secure 17 miles per hour, we should be able to make headway against about eleven-twelfths of

all the winds we should expect, from the means of probability, to encounter.

To be able to meet and overcome all winds, we should have to be equipped with motors and screws giving at least 30 miles per hour.

Was this last-named speed attainable? Theoretically, yes; practically, no. I shall try in a few words to make the answer plain. Resistance of a body moving through the air increases, as we all know, not with the speed, but with the square of the added velocity. I took the best formula—that of the late Colonel Renard, whose brother, Commandant Renard, was one of my valued counselors. I compared the formula with the actual experiences of La France, the Lebaudy, the Santos-Dumont and other successful airships. I found that for a speed of 10 geographical miles per hour we should need about 20 horsepower; for 12 miles per hour, about 40 horsepower; for 17 miles per hour, about 75 horsepower; but that for 30 miles per hour at least 400 horsepower would be required.

Now, it would be possible to put motors of 400 horsepower into our airship. We have at our disposal for machinery, cargo, fuel, and crew about 8,500 pounds. Motors can be built at about 7.5 pounds per horsepower; hence we should have to put at least 3,000 pounds of our weight into motors. The crew, provisions, instruments, etc., must weigh 3,000 pounds, and at the utmost 2,500 pounds would be left for gasoline. As each horsepower hour represents a consumption of 0.7 pound of gasoline, or about 0.85 pound, including the reservoirs and the lubrication, every hour the 400 horsepower motor was worked would cost about 350 pounds in fuel and other weight. For that 350 pounds we should gain 30 miles, or nearly 12 pounds per mile. The distance to the Pole and return being about 1,200 miles, this plan would call for about 14,000 pounds of gasoline, and then we should have no margin over the actual distance in a straight line from Spitzbergen to the Pole and back again.

True, we might build a larger airship. But the larger the ship, the more resistance to be overcome. It might be possible, by constructing an airship five times larger than ours, at a cost of a million dollars, to secure a speed of 25 to 30 miles per hour, and fuel capacity sufficient to voyage to the Pole and return; but I doubt it. At any rate, such speeds are wholly impracticable in our venture. And, fortunately, they are not required for a successful outcome.

One of the ablest of the aeronautic engineers of Paris came to see me, after my decision as to speed and method had been announced in the French newspapers.

"Your plan is all wrong," he declared; "I have come to tell you that you will surely fail if you adhere to that method."

"What do you recommend?" I asked.

"High speed—go quickly as possible—leave all contact with the earth by means of the guide-rope—sail high in the air, and make a fast voyage up and back."

"At what speed?"

"You should make at least 15 meters per second with your motors—55 kilometers per hour."

I asked my friend to sit down and figure out the weight of the motors that would be required to yield this speed, equal to about 30 geographical miles per hour, and the amount of fuel that would be required, remarking that I was afraid he had not sat up nights with the problem as much as I had, and at the same time handing him my computations. He ran over them, saw that they were approximately correct, and, like a gentleman, acknowledged his mistake, saying, "You are right, and I was wrong."

Having reached the conclusion that speeds of 25 to 30 miles per hour were impracticable and unnecessary, there arose the secondary question, What is the highest speed we shall try for? This was involved, also, in the question of the number of motors, their horsepower, and the number and emplacement of the helices or screws.

THE MOTORS AND ENGINES

From the first I was determined not to attempt the voyage with a single motor, though that would represent the greatest economy of weight in relation to efficiency. If we carried but a single motor, and that were to break down, we should be left helpless. Thenceforth we could only drift with the wind, as the brave but unfortunate Andree did in his balloon. Santos-Dumont, who has been so helpful with counsel out of his store of experience that I owe him a large debt of gratitude, advised me to take four motors, each of 25 horsepower, working one, two, three, or four, according to circumstances and needs. But my choice, after long consideration, fell on two motors, one of 50 horsepower and the other of 25, with a smaller one of 5 horsepower to work the ventilator which inflates the balloonet. Engineers Godard, Andre, Hervieu, Liventaal (all associated with the expedition as contractors or as employees) and other experts indorsed my decision.

If one motor were to break down in the field we have another in reserve. If we need full speed we can work both motors together. If a less speed is considered sufficient for the hour, we can use the 50 horsepower motor alone. If the circumstances justify a still smaller rate of progress (and greater economy of fuel in proportion to the distance covered), the 25 horsepower motor may be worked while the larger one is idle.

In case of breakage of one of the motors beyond repair (we shall carry tools and a small machine shop, prepared to make all ordinary repairs in the field), the permanently disabled motor may be thrown overboard, lightening ship.

Another advantage of having two engines and two screws is that while the best of the modern inner combustion motors may be prudently worked many hours without stopping, it is our purpose to take no risks of overheating through too long continuous running, but to stop each motor once in three or four hours for inspection and cooling. While one is idle the other may be worked.

Again, I stipulated in the contract that for the principal or larger propulseur and its shaft we should have reserve parts—another screw and another shaft, all so arranged that in case of accident to one it may be taken out and thrown away and the reserve be fitted in its place. Hence we have in our motive department two motors and three screws and shafts, all of which must be permanently disabled before our navigating power comes to an end.

Considering the average, 12 geographical miles per hour is the speed we expect to attain. This should be secured with an average of about 40 horsepower in operation. It is true that we shall never positively and accurately know what speeds we are to attain until we have the trials of our airship, and these trials we hope to have in Spitzbergen next July. But the contract with Constructor Godard calls for the following efficiencies of the motors:

Motor in operation.	Propulseur.	Meters per second.	Kilom. per hour.	Statute miles per hour	Geographical miles per hour
50 H. P.....	Large.	6.67	24	14.91	12.94
25 H. P.....	Small.	4.72	17	10.56	9.17
75 H. P.....	Both.	8.88	32	19.88	17.27

M. Godard has no doubt we shall be able to realize these speeds. It is not my proper function to pass judgment, but to go into the field and learn through actual trials how well he has worked up to his contract obligations. M. Godard is a conservative, careful man, and I have much faith in him.

With proper speeds of from 9 to 17 geographical miles per hour at our command, we shall be able to cope with approximately eleven-twelfths, certainly four-fifths, of all the winds

that blow over the Arctic Ocean in July or August.

And what are we to do when stronger winds blow? That is another story.

PROTECTION DURING STORMS

With unfavorable winds of higher velocities we shall stop the motors and throw out upon the ice-sheet over which we are sailing a dragging anchor or retardateur—a device calculated to offer the maximum of resistance in proportion to its weight—and by this means to drift slowly with the adverse wind.

Assuming that this method works out as well in practice as in theory—and there are many reasons for believing that it will do so to at least a fair degree—we have then this principle:

1. All the winds that blow with our course, directly or obliquely, add their movement to the advance which we expect to make with our motors and help us so much on our way.

2. But contrary winds of velocities greater than our motor speed, or so great that motoring against them would be an uneconomical use of fuel, are not losses to be deducted at full value from the progress of the airship, because the influence of such winds is largely neutralized by the action of the dragging anchor or retardateur.

In other words, *all* of the value of favorable winds is placed on the credit side of our ledger or log, while only *a part* of the value of the unfavorable winds has to be written down on the debit side.

And the significance of this, in the last analysis, is that it will require a most extraordinary combination of circumstances to prevent us getting more help than hindrance from the winds.

Before I went to Paris to make a complete study of the problem from the standpoint of practical aeronautics, it was a part of the plan to motor in favorable winds or adverse but light winds, and in case of winds both adverse and of relatively high velocity to anchor firmly to the ice by means of grappling irons and steel cables. Eminent aeronautic engineers had said this could be done with safety. They pointed to the fact that the Lebaudy ship had been several times thus firmly anchored to the earth, riding out rather severe squalls.

But this method was condemned by a majority of the practical men who were consulted. Their objection was usually expressed in language like this:

"Yes, you can undoubtedly make firm and safe anchorage in winds of 10, 15, 20 perhaps 25 miles per hour. You can calculate the resistance which your ship will offer to such winds, and put the necessary strength into your anchors, cables, suspensions, and envelope. But supposing that while you are anchored with devices made to stand, say, 25 miles per hour the wind should suddenly freshen to 35 or 45 miles per hour. That would produce a vast increase of the stress upon all your tackle, for the augmentation of pull would be, not simply in proportion to the speed of the wind, but as the square of the added velocity. Your tackle might break, or the form of your balloon might be collapsed by the pressure. If the balloon were to lose the rigidity and symmetry of its form the wind would exert still greater force upon its flattened surface; and that might spell disaster."

Others urged that were a gale of wind to attack the anchored ship the enormous pressure would force the balloon down toward the ice, and might even thrust it, or its suspended car, upon the surface of the ice-sheet with such violence as to wreck the whole affair. They pointed out that the effect of the wind upon the airship in such case would be something like that shown diagrammatically in Figure 1.

In a calm the anchored dirigible would stand as at A. In a wind of 25 miles per hour, for example, it would be forced to a position as at B. With a wind of 35 miles per hour or upward it would be thrust down to C.

They admitted, it is true, that with compensating weights—such as heavy guide-rope equilebreurs, suspended below the ship, and so disposed that they could

come in contact with the ice without injury—there must come an angle, no matter how great the power of the wind, when the downward thrust of its pressure would be offset by the ascending power of the balloon, thus relieved of a considerable part of its weight. But even then there would be the hazard of disaster due to pounding, to plunging up and down with the fluctuating force of the wind, and to the other causes already spoken of.

For reasons which have been already pointed out, it was, in my opinion, imperative that the plan of retaining contact with the surface of the earth through the guide-rope equilebreur, and occasionally by anchorage, should be adhered to.

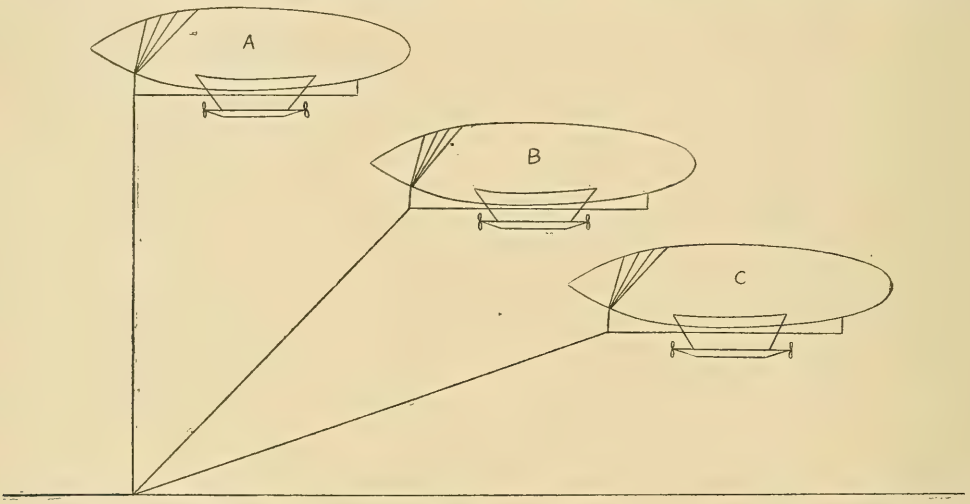


Figure 1.

We shall not attempt to make firm anchorage, save in calms or very light airs, and then only for special purposes, such as scientific observations. In lieu thereof we shall employ the principle of the dragging anchor. When adverse winds of relatively high velocity are encountered, instead of throwing out a grappling hook we shall let trail over the ice a steel cable provided with small projections, like hooks or rings, calculated to give a resistance equal to the pull of the airship in a wind of about 12 to 15 miles per hour. That will mean about 250 kilogrammes of resistance, and it should be secured with a cable weighing about 300 kilos, perhaps less. The surface of the ice offers almost ideal facilities for the operation of such a device, and it is perhaps the only place in the world where this method could be successfully employed over a wide area.

If we arrange our retardateur for working up to, say, 12 miles per hour, with ample margin of strength in all parts, we shall know that this is approximately the maximum stress that can ever be put upon it. There will be no danger of the work being quadrupled by an increase of the velocity of the wind up to 30 or 40 miles per hour.

With a wind of 10 to 12 miles per hour we shall remain approximately stationary in the air, perhaps drifting half a mile or a mile per hour. In a wind of 15 miles per hour we should drift about 3 miles per hour with it. In a wind of 20 miles per hour the driftage should be 8 miles per hour. Should the wind rise to 30 miles per hour the driftage should be about 18 miles per hour. Thus in the higher winds we should lose way according to the velocity, but in no case would we incur risks of rupture of our appa-

ratus by having it subjected to strains greater than it is able to withstand. The maximum strain provided for can never be exceeded, no matter what the force of the wind. The balloon can never be subjected to the stress, the pounding, the violent vertical plunging such as would occur in firm anchorage, where there must be a constant effort on the part of the aeronef to find adjustment between the two forces—one a horizontal pull, the other the lifting power of the balloon. There would be no danger of being thrust down near to or into contact with the ice. All strains would be cushioned, yielding, "giving," with the driftage of the vessel.

It is not necessary to go into details concerning the mechanical aspects of the retardateur. In fact, several methods of securing resistance will be tested at Spitzbergen, and the one which gives best results will be finally chosen.

An important consideration is the method of operating the retardateur; also its point of suspension. If it were payed out from a windlass in the open boat below the car, as we had at first planned, the result would be that the angle of its pull would run according to the line A-B-C in this diagram.

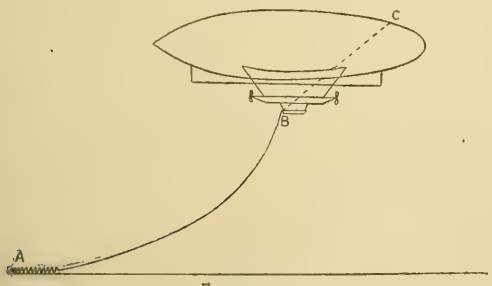


Figure 2.

In other words, the pull of the drag-anchor on the ice at A would be transmitted through the steel boat at B to the rear end of the balloon at C. The airship would be turned round. Its stern instead of its prow would be presented to the wind. After full discussion of this subject with M. Santos-Dumont, who has had more experience in guide-roping and similar work than any one else, and who gave us the full benefit of his practical knowledge, it was decided to adopt the method of suspension and operation shown in figure 3.

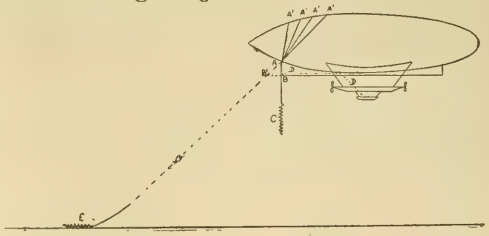


Figure 3.

The retardateur cable is suspended from the prow of the balloon at A, from which point bands of fabric of high tensile strength are passed over the body of the aeronef—A- A′ A′ A′ A′—to distribute the stress.

When the retardateur is not in use it hangs from its operating pulley, B, free from contact with the ice, and out of the way of any possible interference with the forward screw. When it is desired to put it to work it is lowered by means of the line D D D working over pulleys down to a windlass in the steel boat. The moment it strikes the ice and the aeronef drifts backward, the angle of the retardateur cable follows the dotted line. All the pull of the drag-anchor at E is thus exerted upon the forward part of the balloon, and the aeronef always keeps its prow to the wind. If the wind shifts, the balloon turns with it like a weather-vane.

When the wind moderates and the use of the retardateur is no longer needed, and the motors are started, the cable is pulled in by the windlass till it once more hangs vertically at C.

This is the method we have adopted for minimizing the driftage in strong adverse winds—the method which we believe will enable us to take full credit value from all favorable winds and to cut down materially without expenditure of fuel the losses inevitably incident to unfavorable winds.

Mr Wellman realizes the fact that the winds which he will experience will have much to do in making his expedition a success or failure. He has therefore made a very careful examination of the winds during July and August at Spitzbergen, as recorded by the *Fram* parties. A number of the wind tables so prepared by him are given in the following pages:

WIND FREQUENCY IN THE ARCTIC OCEAN

The following table, condensed from the compilations of Professor Mohn, editor of the meteorological volumes of "Scientific Results of the Norwegian Polar Expedition," gives the "averages per mille," or frequency of the winds from the various quadrants of the compass, per thousand observations:

	Southerly Winds, Observations.	Northerly Winds, Observations.	Easterly Winds, Observations.	Westerly Winds, Observations.	Calms, Observations.
July, 1894	347	426	0	189	38
" 1895	520	353	24	97	6
" 1896	711	221	29	39	.....
Mean	526	333	18	108	14
Aug., 1894	381	394	43	106	76
" 1895	470	349	91	78	12
" 1896	358	513	51	78	.....
Mean	403	419	62	87	29
Mean 2 years	464.5	376	40	97.5	22

WIND FREQUENCY AND DIRECTION BY TEN-DAY PERIODS

(From *Fram* Records)

The table shows the number of hours of wind from each quadrant of the compass, and calms.

	Periods.	S.W.	S.E.	N.E.	N.W.	Calm.	Total hours.
A	July 15–July 24, 1894	68	44	34	80	14	240
B	" " " " 1895	10	0	126	102	2	240
C	" " " " 1896	68	44	38	82	8	240
D	July 25–Aug. 3, 1894	94	0	0	146	0	240
E	" " " " 1895	176	46	18	0	0	240
F	" " " " 1896	38	42	92	48	20	240
G	Aug. 4–Aug. 13, 1894	114	6	34	54	32	240
H	" " " " 1895	40	20	2	164	14	240
	Mean	76	25.25	43	84.5	11.25	240

WIND FREQUENCY, DIRECTION, AND VELOCITY BY TEN-DAY PERIODS

		S.W.	S.E.	N.E.	N.W.	Calm.	Total.
A	Hours	68	44	34	80	14	240
	Mean miles per hour	7.6	8	7	9.3	.....	7.7
	Total miles	516	352	238	744	.....	1,850
B	Hours	10	.....	126	102	2	240
	Mean miles per hour	6.5	.....	7.7	7.5	.....	7.5
	Total miles	65	.....	970	765	.....	1,800
C	Hours	68	44	38	82	8	240
	Mean miles per hour	6.4	5.8	7.75	11.85	.....	8.16
	Total miles	435	255	295	975	.....	1,960
D	Hours	94	.....	.....	146	.....	240
	Mean miles per hour	7.75	.....	.....	9	.....	8.5
	Total miles	730	.....	.....	1,315	.....	2,045
E	Hours	176	46	18	.....	.....	240
	Mean miles per hour	14	10	13.2	.....	.....	13.2
	Total miles	2,465	460	240	.....	.....	3,165
F	Hours	38	42	92	48	20	240
	Mean miles per hour	6.5	3.8	7.75	7.4	.....	6.4
	Total miles	245	160	715	355	.....	1,475
G	Hours	114	6	34	54	32	240
	Mean miles per hour	5.5	3.5	5.75	5.5	.....	5.53
	Total miles	630	20	200	300	.....	1,150
H	Hours	40	20	2	164	14	240
	Mean miles per hour	6	8.5	7 5	7	.....	6.94
	Total miles	240	170	15	1,150	.....	1,575
Total	Hours	76	25 25	43	84.50	11.25	240
	Miles per hour	8.78	7.07	7.77	8.29	.....	7.83
	Miles	667	178	334	700	.....	1,879

Mr Wellman has assumed 10 days as the approximate duration of his aerial voyage. From the foregoing records of the actual winds (*Fram*) prevailing in eight such periods in July or August, it will be seen that the number of miles of wind-movement divided between north and south is as follows:

	South.	North.		South.	North.
A	868	982	E	2,925	240
B	65	1,735	F	405	1,070
C	690	1,270	G	650	500
D	730	1,315	H	410	1,165

In only two of the eight periods is there a very great preponderance of winds from one direction over those of the other. One of these has a southerly resultant, the other a northerly.

The mean of the eight periods is: South, 845 miles; north, 1,034 miles.

WIND VELOCITIES IN THE ARCTIC OCEAN IN JULY AND AUGUST BY TEN-DAY PERIODS, GENERAL MEAN, AND ACTUAL, FROM *FRAM* RECORDS IN GEOGRAPHICAL MILES,

WITH CURVES SHOWING THE MEAN AND MAXIMUM VELOCITIES PER PERIOD FOR 100 HOURS OR 140 HOURS, STARTING FROM CALMS

As we have already seen, the navigating method adopted and the supply of fuel carried admit of from 100 to 140 hours of work by the motors, according to the average horsepower employed.

It was important to know, as accurately as possible, what velocities of wind might be expected in a voyage assumed, in order to have a basis of computation, at 10 days' duration.

Hence this Synoptic Table was compiled from thousands of actual observations, showing, first (O) the general mean in July and August, and, second (A, B, C, etc.), the actual winds which prevailed in 14 10-day periods, selected arbitrarily, without reference to whether they would yield favorable or unfavorable results.

Upon this table are drawn two curves—one of 100 hours of motoring, the other 140 hours of motoring. The motoring, naturally, will be, generally speaking, in calms or the winds of smaller velocity. The table being arranged cumulatively, the mean and maximum velocity of the wind is shown at a glance for any given number of hours, starting at calms.

For example, following the 100-hour motor-curve, it is found that in the period of 10 days "O"—general mean—it cuts about halfway between 7 and 8 miles per hour. Hence the maximum wind for this period, with 100 hours of motoring, is 7.5 miles per hour, and the mean for the 100 hours (falling half way between the total miles per hour for 7 and 8) is taken at 5.6 miles per hour. In period A (actual *Fram* observations) the 100 hours of motoring is secured with a maximum wind velocity of a little over 7 miles per hour and a mean of 5.5. In B period the maximum is 7, the mean 6.35, and so on.

O=the mean of the *Fram* observations during three Julys and two Augusts, with 15 per cent added to allow for greater velocities 100 to 300 feet above the surface of the earth.

A, B, C, etc.=actual winds by 10-day periods, arbitrarily selected, to show how much divergence there is in any given 10-day period from the grand mean comprising 155 days.

For each period the first gives the number of hours of wind at the velocity in miles per hour noted at the top of the table; the second line gives the number of miles of wind movement at that velocity; the third, fourth, and fifth lines are cumulative from calms upward. For example, in A, at and including 7 miles per hour, there is a total of 96 hours of wind at that or lesser velocity, with a total wind movement of 520 miles and a mean of 5.41 miles per hour; including 8 miles per hour, there are 136 hours, a total of 840 miles, and a mean of 6.2 miles per hour, etc.

The totals and means for each period are found in the last column at the right. The mean of 14 10-day periods is found at the bottom of the table, marked "Totals." The last line of all is the grand mean miles per hour of 155 days for comparison with the mean miles per hour of the 14 10-day periods in the line just above.

100-HOUR CURVE

140-HOUR CURVE

	Miles per hour.....	1	4	6	7	8	9	11	12 5	15	18	25
	Hours of wind....	10	15	40	25	25	25	25	30	25	15	5
	Miles of wind.....	10	60	240	175	200	225	275	375	375	270	125
O	Total hours	10	25	65	90	115	140	165	195	220	235	240
	Total miles	10	70	310	485	685	910	1,185	1,560	1,935	2,2-5	2,330
	Miles per hour....	1	2.8	4.77	5.4	6	6.5	7.18	8	8.5	9.4	9.7
	Hours.....	16	6	34	40	40	21	21	36	24	2	0
	Miles	16	24	204	280	320	189	231	450	360	36	.....
A	Total hours.....	16	22	56	96	136	157	178	214	238	240	.....
	Total miles.....	16	45	244	520	840	1,029	1,260	1,710	2,070	2,106	.....
	Miles per hour.....	1	1.82	4.36	5.41	6.2	6.55	7.1	8	8.7	8.8	.....
	Hours.....	0	4	50	45	45	36	36	18	6	0	0
	Miles.....	0	16	300	315	360	324	396	225	90	.....	.....
B	Total hours.....	0	4	54	99	144	180	216	234	240	.....	.....
	Total miles	0	16	316	631	991	1,315	1,711	1,936	2,026	.....	.....
	Miles per hour.....	0	4	5 82	6 36	6.58	7.3	8	8.27	8 45	.....	.....
	Hours.....	12	24	46	26	26	13	13	34	26	20	0
	Miles..	12	96	276	182	208	117	143	425	390	360	.....
C	Total hours.....	12	36	82	108	134	147	160	194	220	240	.....
	Total miles	12	108	384	566	774	891	1,034	1,459	1,849	2,209	.....
	Miles per hour.....	1	3	4.66	5.23	5.75	6	6 46	7.52	8.4	9.2	.....
	Hours.....	0	6	24	37	37	39	39	40	16	2	0
	Miles.....	0	24	144	259	296	351	429	500	240	36	.....
D	Total hours.....	0	6	30	67	104	143	182	222	238	240	.....
	Total miles	0	24	168	427	723	1,074	1,503	2,003	2,243	2,279	.....
	Miles per hour.....	0	4	5.6	6.38	7	7.5	8.26	9.02	9.42	9.5	.....
	Hours.....	0	2	6	5	5	19	19	20	68	74	22
	Miles.....	0	8	36	35	40	171	209	250	1,020	1,332	550
E	Total hours.....	0	2	8	13	18	37	56	76	144	218	240
	Total miles	0	8	44	79	119	290	499	749	1,769	3,101	3,651
	Miles per hour.....	0	4	5.5	6	6.6	7.84	8.9	9.85	12.3	14 23	15.2
	Hours.....	28	40	56	26	26	14	14	20	4	12	0
	Miles	28	160	336	182	208	126	154	250	60	216	.....
F	Total hours.....	28	68	124	150	176	190	204	224	228	240	.....
	Total miles	28	188	524	706	914	1,040	1,194	1,440	1,560	1,716	.....
	Miles per hour.....	1	2.76	4.23	4.7	5.2	5.5	5.85	6.43	6.6	7.15	.....
	Hours.....	22	42	120	20	20	10	10	6	0	0	0
	Miles.....	22	168	660	140	160	90	110	75	0	0	.....
G	Total hours.....	22	64	174	194	214	224	234	240	0	0	.....
	Total miles	22	190	850	990	1,150	1,240	1,350	1,425	0	0	.....
	Miles per hour.....	1	3	4.9	5.1	5 38	5 54	5.77	5.94	0	0	.....
	Hours.....	14	6	54	43	43	32	32	4	2	0	0
	Miles	14	24	384	301	344	288	352	50	30	0	.....
H	Total hours.....	14	20	84	127	170	202	234	238	240	0	.....
	Total miles	14	38	422	723	1,067	1,355	1,707	1,757	1,787	0	.....
	Miles per hour.....	1	1.9	5	5.7	6.3	6.7	7 3	7.4	7.45	0	.....
	Hours.....	0	0	12	42	42	44	44	44	10	2	0
	Miles.....	0	0	72	294	336	396	484	550	150	36	.....
I	Total hours.....	0	0	12	54	96	140	184	228	238	240	.....
	Total miles	0	0	72	366	1,702	1,098	1,582	2,132	2,282	2,318	.....
	Miles per hour.....	0	0	6	6.8	7.3	7.9	8.6	9.35	9 6	9.7	.....
	Hours.....	0	4	18	11	11	22	22	22	56	56	18
	Miles.....	0	16	108	77	88	198	242	275	840	1,008	450
J	Total hours.....	0	4	22	33	44	66	88	110	166	222	240
	Total miles	0	16	124	201	289	487	729	1,004	1,844	2,852	3,302
	Miles per hour.....	0	4	5 6	6.01	6.11	7.4	8.25	9	11.11	12.85	13.75
	Hours.....	24	36	50	20	20	13	13	28	16	20	0
	Miles.....	24	144	300	140	160	117	143	350	240	360	.....
K	Total hours.....	24	60	110	130	150	163	176	204	220	240	.....
	Total miles	24	168	468	608	768	885	1,028	1,378	1,618	1,978	.....
	Miles per hour.....	1	2 8	4.25	4.68	5.12	5.43	5.85	6.75	7.35	8.25	.....
	Hours.....	18	36	98	20	20	17	17	8	6	0	0
	Miles.....	18	144	588	140	160	153	187	100	90	0	.....
L	Total hours.....	18	54	152	172	192	209	226	234	240	0	.....
	Total miles	18	162	740	890	1,050	1,203	1,390	1,490	1,580	0	.....
	Miles per hour.....	1	3	5	5.17	5.47	5.75	6.15	6.25	6.6	0	.....
	Hours.....	6	2	50	25	25	41	41	4	26	20	0
	Miles	6	8	300	175	200	369	451	50	390	360	.....
M	Total hours..	6	8	58	83	108	149	190	194	220	240	.....
	Total miles	6	14	314	489	689	1,058	1,509	1,559	1,949	2,309	.....
	Miles per hour.....	1	1.75	5.4	5.9	6.4	7.16	7.94	8	8.86	9.62	.....
	Hours.....	4	28	48	20	24	15	15	8	36	38	0
	Miles.....	4	112	288	168	192	135	165	100	540	624	.....
N	Total hours.....	4	32	80	104	128	143	158	166	202	240	.....
	Total miles	4	116	404	572	764	899	1,064	1,164	1,704	2,328	.....
	Miles per hour.....	1	3.12	5.05	5 5	6	6.3	6.75	7	8.4	9.7	.....
	Hours..	10.4	17.4	47.5	27.4	27.4	24	24	21	21 1	17.6	3.2
	Miles.....	10.4	69.6	285	190	220	216	264	264	320	315	80
Totals	Total hours.....	10.4	27.8	75	102	130	154	178	199	220	237	240
	Total miles	10 4	80	365	555	775	991	1,255	1,519	1,839	2,154	2,235
	Miles per hour.....	1	2.87	4.86	5.45	6	6.45	7	7.80	8 36	9.09	9.30
O	Total miles per hour.	1	2.8	4.77	5.4	6	6.5	7.18	8	8.5	9.4	9.7

In the following interesting tables Mr Wellman has worked out his northing by the navigating method already described by him in the context, for each of the 10-day periods covered by the Synoptic Table, on the basis of 12 miles per hour motoring, for 140 hours, and retardation of 12 miles per hour during 100 hours of drifting, save that in drifting with the lighter winds—12.5, 11, 9, or even fewer miles per hour—the loss is assumed at 1 mile per hour in each case.

The first table shows what might be accomplished with *all* the winds throughout the various periods *directly contrary to the course*. In two cases there would be no progress at all, on account of the velocity of the contrary winds, but in all the others the voyage would continue past, to, or near to the Pole.

EXPERIENCE WITH ALL WINDS ASSUMED AS DIRECTLY UNFAVORABLE TO THE COURSE

Motor period, 140 hours, 12 miles per hour. 1,680 miles.

Drifting period..... 100 hours.
Maximum retardation..... 12 miles per hour.

Mean wind. Miles per hour.	Motor gain over wind. Miles.	Wind, miles per hour..... Drift, miles per hour.....	*9 1	11 1	12.5 1	15 3	18 6	25 13	Total Loss.	Net Gain.
O 6.50....	770	Hours.....	0	25	30	25	15	5		
		Miles lost.....	0	25	30	75	90	65	285	485
A 6.25.....	805	Hours.....	17	21	36	24	2	0		
		Loss.....	17	21	36	72	12	..	158	647
B 6.85.....	720	Hours.....	40	36	18	6	..	..		
		Loss.....	40	36	18	18	..	..	112	608
C 6.00.....	840	Hours.....	7	13	34	26	20	..		
		Loss.....	7	13	34	78	120	..	252	588
D 7.50.....	630	Hours.....	3	39	40	16	2	..		
		Loss.....	3	39	40	48	12	..	142	488
E 12.25.....	—35	Hours.....	..	..	..	4	74	22		
		Loss.....	..	..	..	12	444	286	742	—777
F 4.50.....	1,050	Hours.....	50	14	20	4	12	..		
		Loss.....	50	14	20	12	72	..	165	885
G 4.25.....	1,085	Hours.....	84	10	6	..	..	..		
		Loss.....	84	10	6	..	..	..	100	985
H 5.75.....	895	Hours.....	62	32	4	2	..	..		
		Loss.....	62	32	4	6	..	..	104	791
I 7.90.....	575	Hours.....	..	44	44	10	2	..		
		Loss.....	..	44	44	30	12	..	130	445
J 10.00.....	280	Hours.....	..	..	..	26	56	18		
		Loss.....	..	..	..	78	336	234	648	—368
K 5.00.....	980	Hours.....	23	13	28	16	20	..		
		Loss.....	23	13	28	48	120	..	232	748
L 4.75.....	1,015	Hours.....	69	17	8	6	..	..		
		Loss.....	69	17	8	18	..	..	112	903
M 7.00.....	700	Hours.....	9	41	4	26	20	..		
		Loss.....	9	41	4	78	120	..	252	448
N 6.25.....	805	Hours.....	3	15	8	36	38	..		
		Loss.....	3	15	8	108	228	..	362	443
Mean of the 14 10-day periods.....										490

*Included with 9 miles per hour are in some cases winds of 8, 7, or 6 miles per hour.

EXPERIENCE WITH ALL WINDS OF THE RETARDING PERIOD ASSUMED AS DIRECTLY ADVERSE AND MOTORING PERIOD DIVIDED AS FOLLOWS:

Drifting period, all winds adverse, 100 hours.	Motoring period, 140 hours; motor distance, 1,680 miles; winds, 30 hours favorable, 110 hours unfavorable, at mean velocity.						
			Unfavorable, 110 hours.		Favorable, 30 hours.		Motor, 1,680 miles.
	Loss miles	Mean miles per hour.	Miles.	Total loss.	Miles.	Net loss.	Net gain.
O	285	6.73	715	1,000	195	805	875
A	158	6.25	962	850	190	660	1,020
B	112	6.85	753	865	205	660	1,020
C	252	6.00	660	910	180	730	950
D	142	7.50	825	965	245	720	960
E	742	12.25	1,350	2,090	365	1,725	—45
F	165	4.50	495	660	135	525	1,155
G	100	4.25	470	570	130	440	1,240
H	104	5.75	636	740	170	570	1,110
I	130	7.90	870	1,000	240	760	920
J	648	10.00	1,100	1,650	300	1,350	330
K	232	5.00	550	780	150	630	1,050
L	112	4.75	523	635	145	490	1,190
M	252	7.00	770	1,020	210	810	870
N	362	6.25	688	1,050	190	860	820
			Mean of the 14 10-day periods				900

EXPERIENCES WITH ALL DRIFTING WINDS ASSUMED DIRECTLY ADVERSE AND VARIOUS PERCENTAGES OF FAVORABLE AND UNFAVORABLE IN THE MOTOR-PERIOD

Taking the losses in the 100-hour drift-period from the preceding tables and estimating higher percentages of favorable winds in the 140-hour motor-period, we get results as follows:

	AA. Favorable, 40 hours. Unfavorable, 100 hours. Net gain in 10 days.	BB. Favorable, 50 hours. Unfavorable, 90 hours. Net gain in 10 days.	CC. Favorable, 70 hours. Unfavorable, 70 hours. Net gain in 10 days.
	Miles.	*Miles.*	*Miles.*
O	1,005	1,135	1,395
A	1,165	1,265	1,520
B	1,155	1,295	1,565
C	1,170	1,185	1,430
D	1,080	1,235	1,540
E	210	450	930
F	1,245	1,335	1,515
G	1,325	1,410	1,580
H	1,230	1,340	1,575
I	1,075	1,425	1,550
J	430	630	1,030
K	1,125	1,245	1,450
L	1,280	1,365	1,565
M	1,005	1,150	1,430
N	940	1,065	1,320
Mean of 14	1,030	1,170	1,425

AIRSHIP VOYAGES BY ANALOGY

In his studies of the fascinating problem of the best means to adopt for reaching the North Pole in a dirigible, Mr Wellman hit upon the idea of writing up the log of his aeronef throughout a number of test voyages, assuming that the winds throughout each voyage were the same as those which prevailed at the *Fram*. Accordingly, he named eight dates, somewhat at random, but corresponding generally to the date on which it is expected his trip may be made from Spitzbergen toward the Pole—the latter part of July and early days of August. These dates will be found on the next page. The motor speed of the dirigible is assumed at 12 miles (geographical) per hour. The maximum retardation by the dragging anchor in adverse winds is assumed at 12 miles per hour. Allowance is made for the effect of all winds oblique to the course. For example, in voyage B, from 10 p. m. to midnight, July 25, the wind was SW. at 12 miles per hour, and one-half of its movement, or 12 miles for the two hours, is assumed as the "northing" effect upon the airship.

The start from Spitzbergen is made in the first southerly wind that blows on or after the first of the days named in each of the periods, chosen arbitrarily. Thus the log is written up hour by hour from the *Fram* records, following the method of navigation already described by Mr Wellman in the foregoing pages.

It will be remembered that Dr Nansen's ship, the *Fram*, drifted for three years through the Arctic Ocean, traversing in part the very region the Wellman airship is planned to sail across. As Mr Wellman points out, no one can know that the winds which his airship encounters on its actual voyage are to be like those of any one of these 10-day *Fram* records. But it is only reasonable to assume that they will not be widely different, probably not much better, probably not much worse.

In the most favorable of these examples the vicinity of the Pole is reached in 28 hours.

In the most unfavorable it is reached in 152 hours, of which 68 hours are given to work with the motors and 84 hours to drifting with the retardateur. Inasmuch as it is believed the aeronef can remain in the air from 12 to 20 days, and the fuel supply carried is equal to about 140 hours' motoring, it will be seen that even in this case of the most contrary winds only one-half the radius of the airship is consumed in attaining proximity to the Pole.

It should also be borne in mind that an essential feature of the expedition plan is to carry a complete sledging equipment, with motor-driven sledges, etc., and provisions for 75 days, so that in case the airship should fail through any cause, its crew could resolve themselves into a sledging party and continue their work of exploration or make their way back to the nearest land.

The temperature is not an obstacle to the success of the expedition, as it ranges, during July and the first half of August, about the freezing point, rarely going more than a few degrees above or below zero centigrade. The temperature in the Arctic Ocean in summer is the most constant to be found anywhere on the surface of the globe, and this is a great advantage in aeronautic work, as the gas is subjected to the minimum of dilatation and contraction.

In his studies Mr Wellman has taken account of all other conditions, such as the precipitation of snow, rain, or sleet, which may weigh down the airship, and he has made provisions to meet and overcome this difficulty.

Mr Wellman concludes with the prudent observation that these analyses do not show that he is certain of attaining the Pole by airship, but that they do indicate ground for a reasonable amount of hope and demonstrate that the expedition is planned on a practical and even promising basis.

TEN-DAY AIR-SHIP VOYAGES BY ACTUAL WINDS PREVAILING IN TEN-DAY PERIODS

Argument:

Motor-speed proper of dirigible, 12 miles per hour.
Maximum retardation in adverse winds, 12 miles per hour.
Allowance made for effect of all winds oblique to the course.
Start from Spitzbergen (575 miles from North Pole), with first southerly wind on or after—

A	July 20, 1894	E	Aug. 1, 1895
B	" " 1895	F	" " 1896
C	" " 1896	G	" 10, 1894
D	Aug. 1, 1894	H	" " 1895

Winds throughout assumed to be same as at *Fram* station.

A	Wind.	Miles per hour.	Wind help, 2 hours.	Motor.	Miles north.	Total northing.
July 23.						
N — 2	WbS.	8	4	24	28	28
2 — 4	"	9	5	24	29	57
4 — 6	W.	11	.....	24	24	81
6 — 8	WbS.	9	5	24	29	110
8 — 10	W.	8	.....	24	24	134
10 — M	SWbW.	7.5	7	24	31	165
July 24.						
M — 2	WbS.	6.5	3	24	27	192
2 — 4	"	8	4	24	28	220
4 — 6	"	6.5	3	24	27	247
6 — 8	WSW.	9	8	24	32	279
8 — 10	WbS.	7	2	24	26	305
10 — N	"	9	5	24	29	334
N — 2	WSW.	13	10	24	34	368
2 — 4	WbS.	10	6	24	30	398
4 — 6	"	11	6	24	30	428
6 — 8	W.	11	.....	24	24	452
8 — 10	WbS.	10.5	5	24	29	481
10 — M	"	12	6	21	30	511
July 25.						
M — 2	"	10	6	24	30	541
2 — 4	"	9	5	24	29	570

Total, 40 hours; arrive vicinity the Pole.

B	Wind.	Miles per hour.	Wind help, 2 hours.	Motor.	Miles north.	Total northing.
July 25.						
N — 2	SWbS.	13	16	24	40	40
2 — 4	WbS.	10	4	24	28	68
4 — 6	SW.	11	10	24	34	102
6 — 8	SWbS.	11	12	24	36	138
8 — 10	SW.	10	10	24	34	172
10 — M	"	12	12	24	36	208
July 26.						
M — 2	SWbW.	15	10	24	34	242
2 — 4	SW.	14	14	24	38	280
4 — 6	SWbW.	13	8	24	32	312
6 — 8	SW.	12	12	24	36	348
8 — 10	SWbS.	12.5	15	24	39	387
10 — N	"	15	20	24	44	431
N — 2	SW.	15	15	24	39	470
2 — 4	"	13.5	12	24	36	506
4 — 6	SWbS.	11	13	24	37	543
6 — 8	SSW.	14	15	24	39	582

Total, 32 hours; arrive vicinity the Pole.

C (Observations 4 hours apart.)	Wind.	Miles per hour.	Wind help, 4 hours.	Motor.	Miles north.	Total northing.
July 21.						
N — 4	SE	4	8	48	56	56
4 — 8	NNE.	3	—10	48	38	94
8 — M.	ENE.	3.5	—10	48	38	132
July 22.						
M — 4	NNE.	6.5	—20	48	28	160
4 — 8	NbE.	11	Drift.	1 mph.	— 4	156
8 — N.	N.	12	"	1 "	— 4	152
N — 4	NNW.	14	"	2 "	— 8	144
4 — 8	"	16	"	4 "	—16	128
8 — M.	"	17	"	5 "	—20	108
July 23.						
M — 4	"	18	"	6 "	—24	84
4 — 8	"	17	"	5 "	—20	64
8 — N.	N.	15.5	"	3.5 "	—14	50
N — 4	NNW.	12.5	"	1 "	— 4	46
4 — 8	"	14	"	2 "	— 8	38
8 — M	"	12	"	1 "	— 4	34
July 24.						
M — 4	NW.	10 5	"	1 "	— 4	30
4 — 8	NWbW.	9.5	—30	48	18	48
8 — N.	WbN.	5.5	— 6	48	42	90
N — 4	W.	7	.....	48	48	138
4 — 8	SWbW.	5.5	8	48	56	194
8 — M	S.	5.5	22	48	70	264
July 25.						
M — 4	SSE.	4	12	48	60	324
4 — 8	"	3.5	10	48	58	382
8 — N.	Calm.	.....	.....	48	48	430
N — 4	SE.	1.5	3	48	51	481
4 — 8	EbN	4.5	— 6	48	42	523
8 — M.	ENE.	3	— 5	48	43	566
July 26.						
M — 2	EbN.	5	— 4	24	20	586

Total, 110 hours; arrive vicinity the Pole. 62 hours' motoring. 48 hours' drifting.

D (Observations 2 hours apart.)	Wind.	Miles per hour.	Wind help, 2 hours.	Motor.	Miles north.	Total northing.
Aug. 1.						
N — 2.	SbW.	9	15	24	39	39
2 — 4	"	11	18	24	42	81
4 — 6.	"	11.5	18	24	42	123
6 — 8	"	14	20	24	44	167
8 — 10.	"	12	18	24	42	209
10 — M.	"	13	20	24	44	253
Aug. 2.						
M — 2.	SSW.	9	14	24	38	291
2 — 4	SWbS.	8	12	24	36	327
4 — 6.	SW.	8	8	24	32	359
6 — 8.	SSW.	6	8	24	32	391
8 — 10.	"	6.5	9	24	33	424
10 — N.	SWbS.	5.5	6	24	30	454
N — 2	"	8	11	24	35	489
2 — 4.	SW.	6	6	24	30	519
4 — 6.	SWbW.	6.5	6	24	30	549
6 — 8.	WSW.	7	6	24	30	579

Total, 32 hours; arrive vicinity the Pole.

E	Wind.	Miles per hour.	Wind help, 2 hours	Motor.	Miles north.	Total northing.
Aug. 1.						
N — 2.	SW.	17	16	24	40	40
2 — 4.	SWbW.	13	10	24	34	74
4 — 6.	"	16	14	24	38	112
6 — 8.	WSW.	17	14	24	38	150
8 — 10.	"	15	16	24	40	190
10 — M.	SWbS.	14 5	16	24	40	230
Aug. 2.						
M — 2.	SW.	15	14	24	38	268
2 — 4.	"	12	12	24	36	304
4 — 6.	SSW.	12	15	24	39	343
6 — 8.	S.	16	30	24	54	397
8 — 10.	SbW.	15	24	24	48	445
10 — N.	S.	13.5	25	24	49	494
N — 2.	"	14	28	24	52	546
2 — 4.	"	12	24	24	48	594

Total, 28 hours; arrive vicinity the Pole.

F (Observations 4 hours apart.)	Wind.	Miles per hour.	Wind help, 4 hours.	Motor.	Miles north.	Total northing.
Aug. 2						
N — 4.	S.	6.5	26	48	74	74
4 — 8.	SSE.	5	16	48	64	138
8 — M.	SEbE.	4	6	48	54	192
Aug. 3.						
M — 4.	EbN.	9.5	— 16	48	32	224
4 — 8.	"	12	— 20	48	28	252
8 — N.	"	12	— 20	48	28	280
N — 4.	ENE.	16	Drift.	4 mph.	— 16	264
4 — 8.	NEbE.	17.5	"	5 "	— 20	244
8 — M.	NE.	15	"	3 "	— 12	232
Aug. 4.						
M — 4.	NEbN.	16	"	4 "	— 16	216
4 — 8.	N.	13.5	"	1.5 "	— 6	210
8 — N.	"	17	"	5 "	— 20	190
N — 4.	"	16	"	4 "	— 16	174
4 — 8.	"	15	"	3 "	— 12	162
8 — M.	NWbN.	14	"	2 "	— 8	154
Aug 5.						
24 hours.	NW.	16	"	3 "	— 72	82
Aug. 6.						
24 hours.	NW.	12.5	"	1 "	— 24	58
Aug. 7.						
M — 4.	NWbW.	6	— 10	48	38	96
4 — 8.	"	6	— 10	48	38	134
8 — N.	W.	10		48	48	182
N — 4.	WNW.	6.5	— 12	48	36	218
4 — 8.	W.	5.5		48	48	266
8 — M.	WSW.	6	12	48	60	326
Aug. 8.						
M — 4.	WSW.	9	14	48	62	388
4 — 8.	W.	8		48	48	436
8 — N.	"	8		48	48	484
N — 4.	WSW.	4.5	8	48	56	540
4 — 8	SW.	6	12	48	60	600

Total, 152 hours; arrive vicinity the Pole. 68 hours' motoring. 84 hours' drifting.

G (Observations 2 hours apart.)	Wind.	Miles per hour.	Wind help, 2 hours.	Motor.	Miles north.	Total northing.
Aug. 11.						
M — 2	SW.	6	6	24	30	30
2 — 4	SWbS.	5	6	24	30	60
4 — 6	SW.	7	7	24	31	91
6 — 8	SWbS.	7	8	24	32	123
8 — 10	SSW.	8	10	24	34	157
10 — N	SW.	10	10	24	34	191
N — 2	"	10	10	24	34	225
2 — 4	"	7.5	7	24	31	256
4 — 6	"	10	10	24	34	290
6 — 8	"	7	7	24	31	321
8 — 10	"	6.5	6	24	30	351
10 — M	SWbS.	8	10	24	34	385
Aug. 12.						
M — 2	SWbS.	5	6	24	30	415
2 — 4	"	5	6	24	30	445
4 — 6	"	5	6	24	30	475
6 — 8	WSW.	4.5	3	24	27	502
8 — 10	"	5	4	24	28	530
10 — N	"	4.5	3	24	27	557
N — 2	SWbW.	5.5	4	24	28	585

Total, 38 hours ; arrive vicinity the Pole.

H (Observations 2 hours apart.)	Wind.	Miles per hour.	Wind help, 2 hours.	Motor.	Miles north.	Total northing.
Aug. 18.						
N — 2	WbS.	12.5	6	24	30	30
2 — 4	SW.	13.5	13	24	37	67
4 — 6	SWbW.	12.5	10	24	34	101
6 — 8	SW.	15	15	24	39	140
8 — 10	SWbS.	15	16	24	40	180
10 — M	SW.	14	14	24	38	218
Aug. 19.						
M — 2	SW.	12	12	24	36	254
2 — 4	"	13	13	24	37	291
4 — 6	SWbW.	9.5	8	24	32	323
6 — 8	WbS.	7.5	4	24	28	351
8 — 10	NW.	6.5	—7	24	17	368
10 — N	WbS.	7	3	24	27	395
N — 2	WbN.	12	—8	24	16	411
2 — 4	WbS.	11	6	24	30	441
4 — 6	"	10	5	24	29	470
6 — 8	"	9	4	24	28	498
8 — 10	"	7	2	24	26	524
10 — M	SSW.	6	7	24	31	555
Aug. 20.						
M — 2	SW.	10	10	24	34	589

Total, 38 hours ; arrive vicinity the Pole.

FARMING ON THE ISTHMUS OF PANAMA

By Dillwyn M. Hazlett

FROM personal experience and observation extending from Colon to Panama, I can sincerely indorse what the Isthmian Canal Commission said in its last report: "In view of the gratifying conditions shown by recent statistics, it may be safely said that the problem of sanitation need no longer be considered a formidable obstacle to the construction of the canal." Any person in the States can go to the Isthmus and do the same kind of work, and as much of it, as at home and enjoy just as good health as at home, when attention is paid to the ordinary laws of health.

I bought a Panama hat, a pair of leggins, and a khaki suit. For four weeks I rode on the railroad, sailed along the coast, rowed up and down the Chagres River, and tramped through the tropical undergrowth, frequently myself cutting the way with the machete. And I did not go empty handed. I had either my 8 x 10 or 11 x 14 camera and a dozen plates, and sometimes both. I found this no different from doing similar work in the summer time anywhere. The thermometer, by my own record, never went higher than 86 degrees in the shade at midday, and was as often only 82 and 84 degrees in the shade. There was always a nice breeze and fewer pestiferous insects than I had found in many places in the States.

The most perplexing question that con-

Photo by Dillwynn M. Hazlett

Panaman Corn Farm

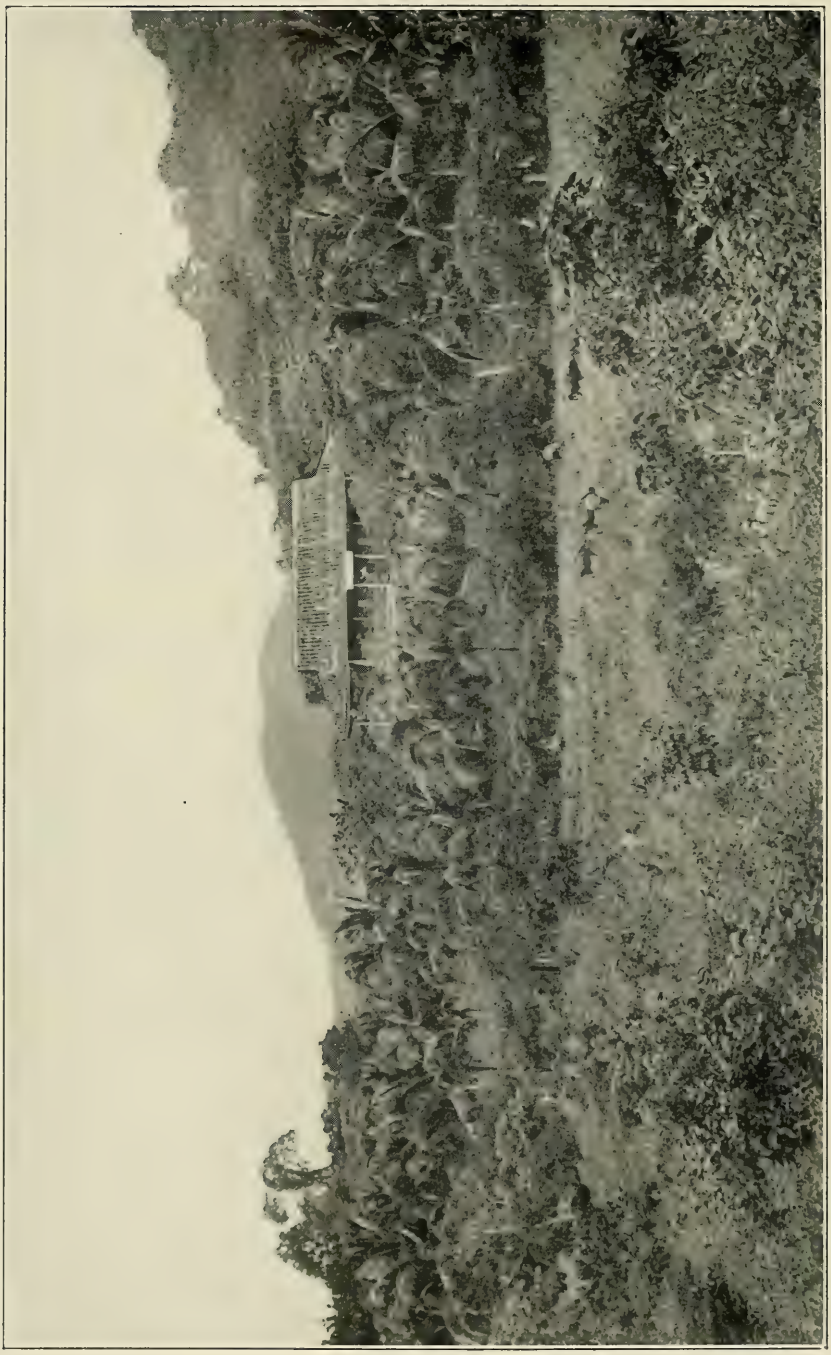


Photo by Dillwynn M. Hazlett

Farm of Albredo Aleman, Panama

Photo by Dillwynn M. Hazlett

Panaman Mango

fronts the Isthmian Canal Commission and will confront the contractor, if the work is sublet, is that of "unskilled labor." The report of the Commission is: "The question of labor is a grave and perplexing one. A sufficient supply of labor can be secured from near-by tropical islands and countries, so far as numbers are concerned. The question of quality is a very different matter. Unless a much greater efficiency can be developed than is secured at present, it will be necessary to look elsewhere for a better class. As compared with the best common labor in the United States, its efficiency is rated at from 25 to 33 per cent." I do not believe that either the government or the contractor will be satisfied with this inefficiency. If they are the canal will not be finished in less than 20 years, or at less than four times its estimated cost. All alien labor is inefficient in comparison with the good common labor in the United States. The best way to get rid of the inefficiency of alien labor would be to employ the brawn of the farm and factory that is in the States. With good sanitation, housing and feeding, and a fair wage, this kind of unskilled labor could be had. To thousands of our citizens labor has not yet become dishonorable, nor has the spirit of patriotism departed. We as Americans have said, "The canal shall be built." "We shall succeed where others fail." "We have not only the money and

Photo by Dillwynn M. Hazlett

Panaman Cattle

the brains, but also the muscle necessary successfully to complete this great and good work, beneficial not only to ourselves, but to the whole world."

A recent writer, concerning the feeding of the men employed on the canal, says: "Panama is 2,000 miles distant from a base of supplies, and the greater part of the work will necessarily be done in a jungle and under severe climatic conditions." This is the usual idea of those who have not visited the Isthmus and familiarized themselves with the facts. If the "climatic conditions are severe" now, will they not be so when the canal is finished? Will not its maintenance require that work to be done "under severe climatic conditions"? I found these "severe climatic conditions" today to be such that scores of men now employed on the Isthmus have determined to make it their future home. The small population of the Isthmus is not due to the "severe climatic conditions" as much as to the ignorance of the true climatic conditions, the marvelous fertility of the soil, and the natural resources of the country. As these become better known, we will witness a rapid increase of its population.

Nor will "the greater part of the work necessarily be done in a jungle." The canal route follows in the main close by the Panama Railroad from Colon to Panama. It passes through cultivated fields as well as through virgin tropical forests. The distance from Colon to Panama is 47.65 miles, with the follow-

ing 28 stations intervening: "Cristobal, Mount Hope, Mindi, Gatun, Lion Hill, Ahorca Lagarto, Bohio, Frijoles, Tabernilla, Barbacocas, Empire, Culebra, Rio Grande Superior, Cucaracha, San Pablo, Bailamonos, Mamei, Gorgona, Matachin, Bas Obispo, Las Cascadas, Paraiso, Pedro Miguel Junction, Pedro Miguel Tank, Mira Flores, Corozal, La Boca Junction." Some of these stations, like those along railroads in the States, consist of a house or two, while others are respectable little villages.

Then the base of supplies need not be "2,000 miles distant from Panama." If we move "the base of supplies" from New York city to Mobile, New Orleans, or Galveston, we bring it 600 miles, or from one and a half to two days by steamer, nearer Panama. But as we are moving, let us keep on and move it all the way to Panama. Why?

The soil of the Isthmus is the best in the world and, in conjunction with climatic conditions, produces fine fruits, vegetables, and cereals, with perpetual pasturage for cattle and fowl. Every kind of vegetable grown in the United States except celery and asparagus does well. They can be planted in succession, so that there will be a perpetual supply, the quantity that can be raised depending only on the amount planted and cultivated. Of fruits, the pineapple and banana mature in one year from the time of planting; oranges and cocoanuts, in eight years, although both begin bearing before that time. Figs, I think, can be successfully introduced and will yield well.

Rice and corn yield fair crops, and doubtless the quality and quantity per acre could be increased by cultivation and selection of seed. It is usual to raise three crops of corn on the same ground during one year, and although the soil is absolutely uncultivated, excellent corn is harvested. The method of raising corn is to cut down the forest that covers the ground; then, as soon as it is dry enough to burn, to set fire to it. This fire heats the surface of the soil and kills the seed of weeds therein. The next morning the corn is planted. The soil is so loose that the first man just makes a little hole with the point of his machete. The next man drops in the grains of corn, and the man behind covers the grains with his toe. They don't know anything about "the man with the hoe." The corn of course gets the start of the weeds, deeper down, so that later the weeds are handicapped in their growth by the shade of the corn. As can be seen from the picture, the results, without any cultivation whatsoever, equal those obtained only by good cultivation in many places in the States.

The picture of the orange tree shows that these trees will grow and bear fruit even under adverse conditions. The history of this particular tree is that six years ago, in eating an orange in his garden, Mr Alfredo Aleman threw the seeds over the fence. Shortly afterwards he noticed that one of these seeds had lodged in the crevice of a rock and was growing. So he determined to let it alone. It continued to grow, and, as can be seen, the roots have covered the rock, finding their way into the fertile soil, so that it is laden with fruit.

The land between Colon and Panama is not sandy, stony, or mountainous. Only shallow blue valleys sentineled by low, verdant hills. Everywhere the soil is fertile as a garden, producing abundantly when merely tickled. American truck gardeners could produce an abundance of all the fruits and vegetables that would be needed, no difference how great the number of the employed might be. Where the virgin forest has been cut away and the soil tilled, there is no malaria, fevers, or mosquitoes. These results follow in the tropics just as they do like work in Kansas, Missouri, or anywhere else. Cattle and fowls do well. There is an abundance of fish of the very best kinds in the waters on both sides of the Isthmus. In fact, "Panama," is an Indian word meaning "Abundance of Fish."

While it is true that "the natives never look beyond their present necessities"

(and they do not need to do so), and hence "no surplus food supply ever accumulates," this condition need not continue. I am informed by the Isthmian Canal Commission that under certain conditions land can be leased for five years in the Canal Zone. While of course it will be necessary for a year or more to import from the States the food needed by the employees, this practice will not be continued through all the years of the work and after the work is completed. This difficulty that stands in the way at present, like others, may disappear speedily through American ability, intelligence, and energy.

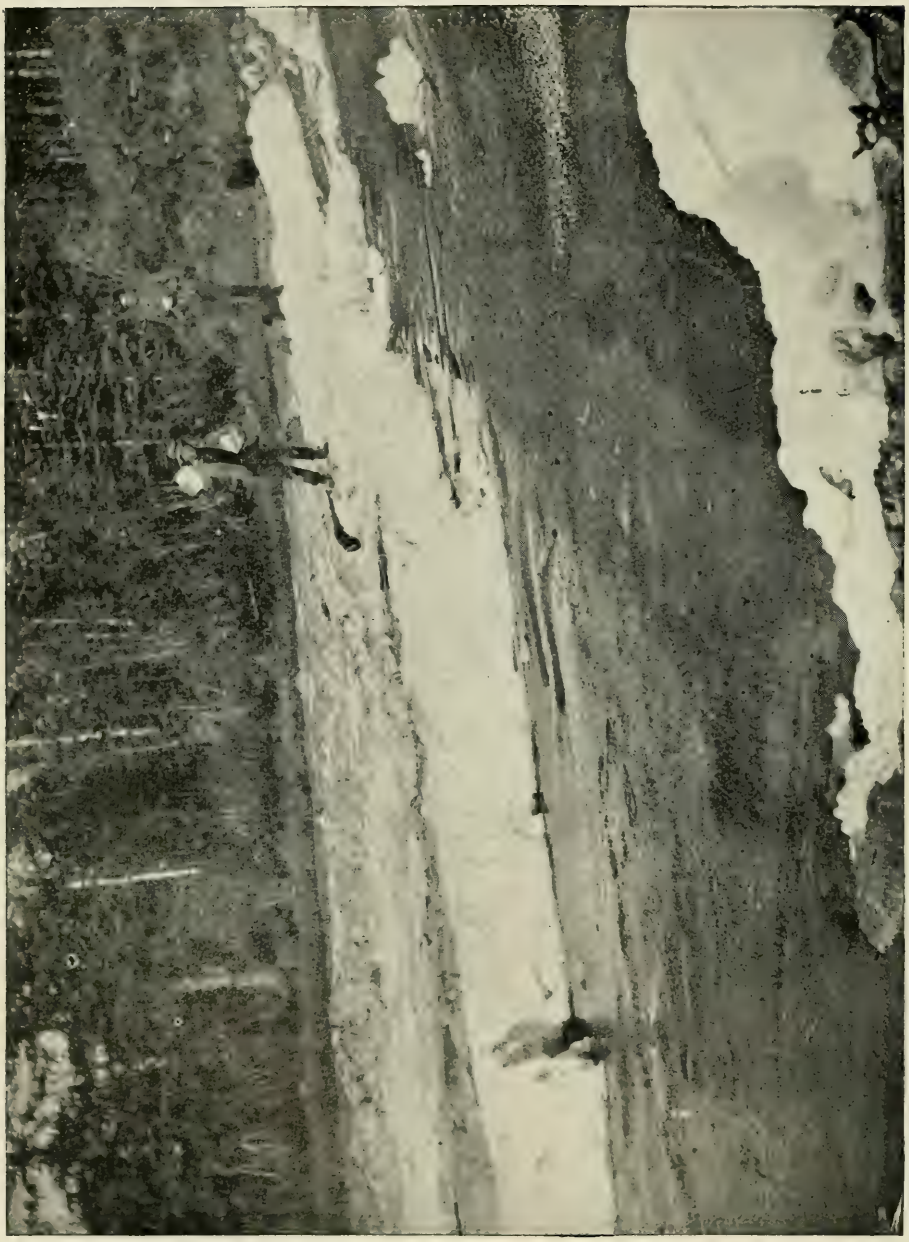
Photo by Dillwynn M. Hazlett

Orange Tree, Six Years Old, Panama (see preceding page)

From the U. S. Department of Agriculture

A Group of Highland Cattle on the Farm of Mr W. M. Van Norden, Rye, N. Y.

The Department of Agriculture believes that this type of cattle can be successfully introduced into colder regions of the United States and into Alaska. At present there are only two or three herds in this country



From "Canadian Life and Resources"

The Wonderful Salt Deposit in the little known Athabasca District of Northern Alberta

AN INTERESTING PHOTOGRAPH

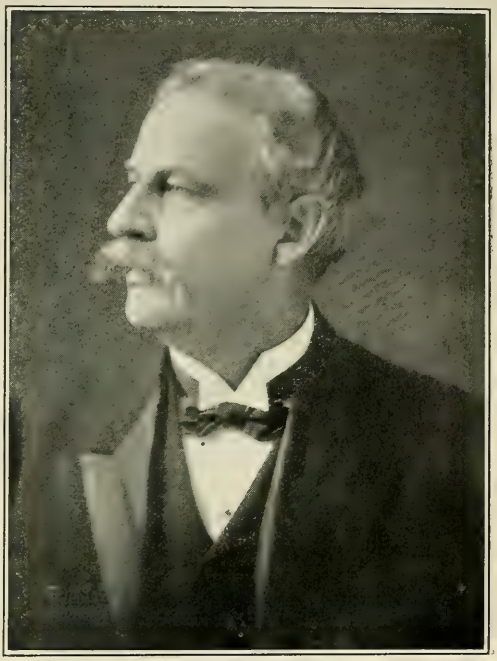
THE first impression from the picture on the opposite page is that it is a winter scene, with a river flowing past snow-covered banks; but what looks like snow is in reality the purest salt. It furnishes excellent table salt without further preparation. Some six feet underneath it a coarser quality, similar to the "Liverpool salt," is found. Springs of water running through this salt bed are surcharged with salt and deposit their residue in the form shown in the picture. The trees in the background are underlaid with pure white salt, and on the removal of the top soil to a depth of some three or four feet a solid hill of salt is reached.

MAGNETIC SURVEY OF THE PACIFIC OCEAN

THE Yacht *Galilee,* engaged in the magnetic survey of the Pacific Ocean, under the auspices of the Carnegie Institution of Washington, left San Diego, California, on March 2 to enter upon her second cruise. She is expected to make the following circuit of about 20,000 miles by the end of this year: San Diego, Fanning Island, Samoan Islands, Fiji Islands, Marshall Islands, Guam, Yokohama, Aleutian Islands, and back again to San Diego.

It was necessary to reorganize the scientific personnel, as those of the former staff belonging to the U. S. Coast and Geodetic Survey were obliged to return to their official duties at the expiration of their furloughs. The command of the vessel has accordingly now been entrusted to Mr W. J. Peters, formerly of the astronomical and topographical corps of the U. S. Geological Survey. He has had considerable experience in difficult geographical work, was second in command and in charge of the scientific work of the recent Ziegler Polar Expedition as the representative of the National Geographic Society.

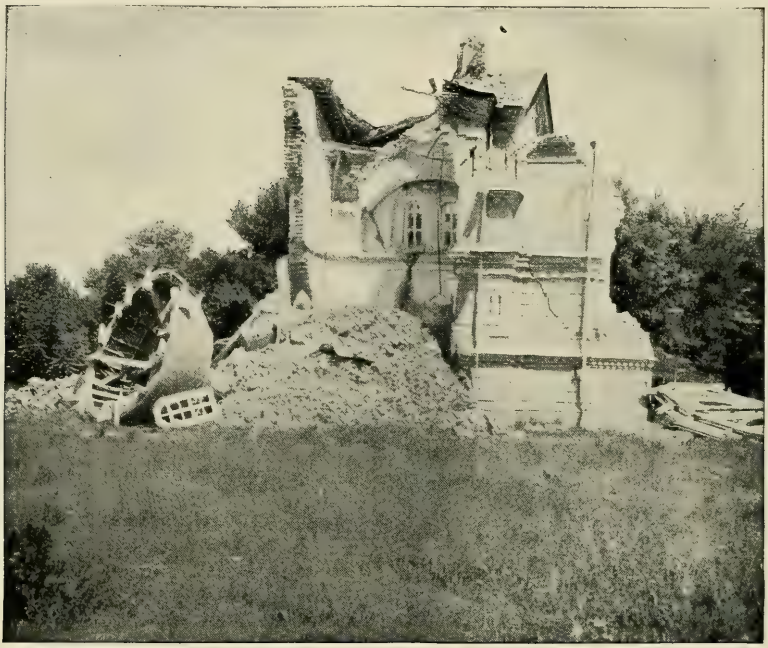
In connection with the latter expedition, Mr Peters made a valuable series of magnetic, meteorological and tidal observations at Teplitz Bay, Franz Josef Land. The other members of the present staff are: Mr J. P. Ault, magnetic observer (likewise a member of the former staff); Mr J. C. Pearson, magnetic observer (formerly instructor of physics at Bowdoin College), and Dr H. E. Martyn, surgeon and recorder. While the vessel was at San Diego some additional changes and improvements were made both in the ship and in the instruments employed. Sufficient funds have been allotted so as to permit carrying on this work continuously throughout the year.



Walter Wellman

According to a dispatch received at the office of the Department of Terrestrial Magnetism of the Carnegie Institution of Washington, the Yacht *Galilee,* engaged in the magnetic survey of the Pacific Ocean, arrived safely at Fanning Island on March 31, having accomplished the trip of 3,500 miles from San Diego in 29 days, besides executing successfully magnetic work along the entire cruise.

L. A. BAUER.



Russian Chapel after the Earthquake, Andijan

From O. T. Crosby, "Tibet and Turkestan"

A Kashgar Crowd

From O. T. Crosby, "Tibet and Turkestan"

A Samarcand Jewess in Ceremonial Attire

Tibet and Turkestan. By Oscar Terry Crosby. With illustrations, map, and index. Pp. 321. 5¼ x 8 inches. New York and London: G. P. Putnam's Sons. 1905.

The story of Tibet and Turkestan, past and present; something of the daily life and surroundings of the people, their religions, customs, and institutions, and the political situation of the country have been included in the twenty-one chapters of the book. The author's experiences in traveling through the freezing climate of the Tibetan plateau are extremely interesting, giving the uniniated a general idea of the hardships undergone by travelers seeking to unravel the mysteries of Tibet.

Irrigation and the "Yellow Peril" are discussed, but the author does not seem to think that we should fear much from the latter, though he believes that China has shown her capability of future strength. She has built and is maintaining a telegraph line from Pekin to Kashgar, a distance of more than 2,000 miles,

so quietly that its establishment has been almost unnoticed by many well-informed people outside of China.

The wisdom of the Tibetan war is doubted by Mr Crosby, and he claims that his views are in accord with those of many Englishmen whose opinions carry weight.

The preface contains a bibliography and there are several appendices, one being a collection of Tibetan songs which show "the characteristics of a people who are as yet very unfamiliar to us."

THE ROOSEVELT GLACIER

NEW YORK, *February* 19, 1906.

Editor National Geographic Magazine.

DEAR SIR: I wish to report to you the existence of five glaciers in the Wind River Mountains of Wyoming. These glaciers were visited by Mr Howard Fuguet, of Philadelphia, and myself, with our guides, in September, 1904, and September, 1905. After careful inquiry we are convinced that we are the first persons to visit these glaciers. I have talked with many persons resident in that portion of Wyoming, and last summer wrote the Geological Survey in regard to them, but have failed to find that they have ever been visited save by our party.

They are situated on the head of Green River, near Fremont's and the neighboring peaks. The three main ones lie in crescent shape on the north and east sides of Fremont's and the adjacent peaks, and are of considerable size, measuring roughly three miles around the curve of the crescent, one mile in width, and two hundred feet in thickness. Except in seasons of light snowfall, the rock ridges which separate these glaciers are covered with snow, giving the appearance of one large glacier.

The President has very kindly given his permission to call these the Roosevelt Glaciers, and we have so named them. The other two glaciers lie, one three miles to the west and the other four or five miles to the north of the main ones, and are very much smaller.

Yours truly,

C. M. TAINTOR.

NATIONAL GEOGRAPHIC SOCIETY

Wednesday, April 4—Hubbard Memorial Hall, 8 p. m. "The Fundamental Principles of Buddhism." By Rt. Rev. Shaku Soyen Lord Abbot, of Yengakuji Temple, Kamakura, Japan. Dr D. T. Suzuki, of Tokio, will act as interpreter.

Friday, April 6—Hubbard Memorial Hall, 8 p. m. "Photographing Wild Game with the Flashlight." By Hon. George Shiras, 3d. Some remarkable photographs by Mr Shiras will be shown on lantern slides.

Saturday, April 7—National Rifles' Armory, 920 G St., 8 p. m. "The Cannibal Regions of the West Central Sudan." By Dr H. Karl W. Kumm, F. R. G. S. Illustrated. The lecturer has been for several years a medical missionary in the Sudan. He will incidentally describe the "sleeping sickness."

Tuesday, April 10—Hubbard Memorial Hall, 8 p. m. "The Reduction of the Samaon Root, an Evolutionary Study in Archetypal Philology." By William Churchill.

Monday, April 16—Hubbard Memorial Hall, 8 p. m. "The Home of the Indo-European." By G. M. Bolling, Ph.D., Professor of Greek Literature and Comparative Philology and Sanskrit in the Catholic University of America.

Friday, April 20—Hubbard Memorial Hall, 8 p. m. "The Protection of the United States Against Invasion by Disease." By Dr Walter Wyman, Surgeon-General Marine Hospital Service.

It is hoped that official business will permit the Secretary of the Navy, Hon. Charles J. Bonaparte, to address the Society during May. The address by Mr George Kennan, previously announced for April, has been postponed until November, as Mr Kennan does not return from the Far East until the latter part of May.

The following committees for the year 1906 have been appointed by President Willis L. Moore:

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VOL. XVII, No. 5 WASHINGTON MAY, 1906

THE NATIONAL GEOGRAPHIC MAGAZINE

THE NEW BRITISH EMPIRE OF THE SUDAN*

BY HERBERT L. BRIDGMAN

GREAT BRITAIN today dominates the whole of Africa and has its future within her control as surely and as firmly as that of India. Germany in the northwest and southeast; France, Belgium, and Portugal around the margin of the Atlantic and the Indian oceans, may have their "holdings" and their territorial jurisdiction; but the spinal column, the Cape-to-Cairo trunk line through the continent from north to south, is wholly and irrevocably English, and whenever it becomes necessary to make this fact emphatic and forcible, then the mastery of the situation, the advantage of the position, will be demonstrated. In the meantime Great Britain, applying the same principles which have made her the great colonial power of the world, goes on developing the industrial and commercial resources of the countries which have fallen under her influence, establishing law and order, schools, even higher institutions of learning, and pouring in upon the places which have for centuries been shrouded in darkness the light of modern civilization. The fact is that modern methods have accelerated civilization at large almost as rapidly as in detail; with steam and electricity in the service, the spread of the institutions of the civilized world is immeasurably more rapid than a century ago, and what then would have taken a generation to accomplish is now effected in a few years.

Since the recapture of Khartum and the conquest of Egyptian Sudan barely seven years have passed, but peace, plenty, and prosperity reign everywhere. Happiness and content are written on every countenance; life is as safe as in England or in New York, and the future, material and moral, seems normal, wholesome, and auspicious. "Sudan needs only population and capital," said a prosperous Greek merchant with whom I became well acquainted at Khartum, "and both are coming to it in ample measure." On one plantation near Berber, the other day one hundred and twenty children, the eldest less than six years of age, all children of the men and women employed on the place, were photographed, and the streets and bazaars of Omdurman, the commercial capital, as well as those of every working station along the White Nile, give cumulative proof of the dawn of the new era of good times.

*An address to the National Geographic Society, February 16, 1906. This is the second of a series of articles on Africa arranged for the NATIONAL GEOGRAPHIC MAGAZINE during 1906. The first in the series, "Morocco," by Mr Ion Perdicaris, appeared in the March number.

THE SIZE OF THE SUDAN

The true significance of Great Britain's peaceful conquest might more readily be appreciated if the size of the Sudan were considered. True, its boundaries are not altogether determinate and irrevocable; one or two rebellious sheikhs on the west are awaiting the return of reason or the arrival of a punitive expedition—the option is largely theirs. Questions of administration have pushed the northern boundary to Shellal, at the head of the first or lowest cataract of the Nile, but in a general way the Sudan extends from the Red Sea 20 degrees of longitude west to the Sahara, and from Egypt 20 south to the Equator. Various exceptions and re-entering angles should be cut in this parallelogram, but it is roughly accurate and will serve for the purposes of comparison.

Reduced to the simplest terms of American geography, it may be said that if Khartum, the Sudan capital, were placed on St Louis, the northern boundary would fall near Saint Paul and Minneapolis; the southern would be about on the parallel of Memphis, Tennessee, while its Red Sea port, Suakin, and its yet to be fixed Saharan outpost would find counterparts in Cincinnati, Ohio, and Denver, Colorado, respectively. When it comes to comparison of areas, only the largest of our American states has any show; a dozen of the smaller Atlantic coast states could be readily accommodated in the Sudan.

Of course, the resources of this inland empire are as yet hardly guessed at. It is certain that as an agricultural field it is in some parts along the thousands of miles of the Nile valley peerless, inexhaustible. Cotton, wheat, and cane are staple and give every promise of prolific crops, while further afield there are all the indications of excellent stock ranges and cattle-raising. Rubber and many of the tropical fruits promise in the Nile districts to afford satisfactory results, while the specialties which have composed the greater part of the Sudan commerce from the dawn of recorded time—ivory, gum, and ostrich feathers—all worth almost their weight in gold, and which can bear the cost of transportation, are absolutely without fear of competition.

THE POLITICAL SITUATION

Without entering on the complex and unique relations and functions of the English chief official in the Nile Valley, it may be worth while to tell you an anecdote of an actual incident which will perhaps make the situation fairly clear to the average republican and undiplomatic understanding. Upon one occasion negotiations had progressed to a point where Lord Cromer required, as a matter of form, the Khedive's signature to a state paper. Waiting upon him for that purpose in the khedivial palace, Lord Cromer was more surprised than annoyed to observe a certain querulousness and quibbling over small matters in the young monarch, which betokened a rather critical, not to say rebellious, mood. Finally screwing his courage to the sticking point and giving rather free rein to his imagination:

"But what if I don't choose to sign?"

"Then, Your Highness, Ceylon," blandly observed Lord Cromer.

"Ceylon?" asked the young monarch, as he recalled Arabi Pasha and his exile.

"Yes," replied the imperturbable Englishman.

"But suppose I ignore your threat and still refuse to sign," persisted the Egyptian.

"Perhaps Your Highness will do me the favor to look from this window a moment," proposed the viceroy.

The Khedive rose, crossed the room, and side by side with Lord Cromer looked down on a full battalion of Highlanders, drawn up, under arms, in the palace yard below. Not a word was said, but he resumed his seat and affixed his autograph with no further remark on that or any subsequent occasion.

Like the fabled Phœnix of ancient Lydia, neighbor of the Sudan, Khartum has risen from its ashes, from its years of war and desolation, and it is difficult to

realize that only seven years ago this enchanting spot was little more than a barren and wind-swept waste, the miserable home of a few wretched faithful, who persisted, despite the Khalifa's purpose to obliterate the place. A completely new city has been laid out by the British engineers, and much of the permanent improvements, street and sidewalk construction, paving and curbing on the best modern lines, has already been completed. Building is everywhere going on; the most important public offices are finished and occupied, and the town has an air of modern enterprise and development, combined with substantial permanence, which it would be difficult to parallel elsewhere in the world. Every public structure of any importance is of kiln-burned brick; most of the shops and warehouses are also of the same material. Some of the dwellings and smaller buildings are of native sun-dried brick made from the soil, which is very satisfactory for many purposes, while wood, both on account of cost and the climate, is altogether out of the question. The new Mohammedan mosque, in the most commanding and central square of the city, is of a light "Ohio" sandstone and of much architectural merit.

KHARTUM RESEMBLES WASHINGTON IN PLAN

The ground plan, if this is the word, of Khartum is altogether new and original and reminds an American at once of that of the city of Washington. Long diagonals cross the streets and avenues, intersecting at right angles, and frequent open spaces or "circles" carry the resemblance into still closer detail. The army engineers who planned the town will tell you honestly that military considerations guided them, and that a very few field pieces can command the city, which is obviously true; yet we never think of these things in our merited gratitude to L'Enfant for his admirable design of our National Capital, more than a century ago. The two principal avenues, traversing the town from end to end, are Sirdar and Khedive, while many of the streets and squares, though in constant use, are as yet without names.

In its treatment of the river front, however, Khartum, the latest city, has given an example to all the world, and adopted a plan which assures beauty and blessing for all time. On the bank of the Blue Nile, here fully fifty or sixty feet above the water, a broad avenue has been laid out, probably 100 feet in the clear, and upon this no trespass of business structures or commercial appropriation will be permitted. It is a modified Riverside drive in the heart of Africa, and will surely grow more and more beautiful as the years go on. For some distance in front of the Sirdar's palace a river wall, a splendid piece of solid stone masonry, has been completed, and ultimately will be continued along the entire water front, thus insuring protection against the destruction of the bank by the floods of "high" Nile. Occasional stages, at convenient points, will permit the landing of passengers and freight, and with rare good judgment the "sakiehs," or water wheels, raising the water for irrigation, have been undisturbed, and the patient bullocks, prodded by the lazy boy, who rides the while, still pursue their weary round from sun to sun, while the clumsy machine, unchanged for thousands of years, gives out its plaintive creak, like the last wail of an utterly weary and exhausted soul.

KHARTUM'S STRATEGIC POSITION

The future of Khartum is even now in its infancy clearly foreshadowed. Reaching the Nile and the Red Sea by rail and Abyssinia and Uganda and the Belgian Congo by water, there is no doubt of its commercial supremacy, and that it must soon become, if not the largest city of Africa, as some of its admirers predict, the political center and the business metropolis. None of our American cities, not even Chicago, at the head of the lakes, has the advantages of location which Khartum possesses—advantages which are sure to grow more and more

important and determining as interior transportation improves and steam displaces animal traction and human porterage. In its municipal functions the future divisions of Khartum are also even now clearly outlined. The administrative headquarters, military and civil, will inevitably continue where they now are, in the city proper, the residence of the governor general and commander-in-chief and of all the principal subordinates and heads of departments; the railway terminal, and particularly the freight depot and dock yard, will remain on the opposite side of the river, at Halfaya, or Khartum North, insuring great convenience in handling and transshipment by water, both receiving and dispatching, while the vast native population, with its wholesale and retail markets and all its myriad activities, will be accommodated as now, at Omdurman, the Mahdi's city, seven miles away and just below the junction of the Blue and White Niles. Here will center the traffic of the western and southern Sudan, for it now holds, in spite of every effort to dislodge it, the gum market of the world; and here also must continue the headquarters of the retail trade of the province. Within the Khartum military district as it is now constituted, and comprising the three above named centers, are probably 70,000 inhabitants, of whom more than half live in Omdurman, possibly a tenth in Khartum proper, the latter including all told not over 300 British army officers and civilians, the remainder occupying Khartum North and the environs between the two Niles. Do you wonder, after these figures and after what has happened, that the British flag everywhere fronts the Egyptian, and that nearly all the field officers of the Sudan regiments hold also commissions in the King's service? Even now they are talking of the time, soon to come, when there will be but one flag, and there's no doubt which.

GORDON MEMORIAL COLLEGE

No sketch of Khartum, "the Phœnix City," would be in any degree complete or adequate without a description of Gordon Memorial College, now about in the middle of the second year of practical work, and which represents the very latest and closest application of educational theories put to practice. Some idea of the part which Gordon College is expected to play in the regeneration of the Sudan may be gathered from the fact that King Edward is its patron, Lord Kitchener of Khartum its president, and Lord Cromer, the Sirdar, Sir Ernest Cassel, and Lord Revelstoke, and men like them, among its trustees. Director and at the head of its teaching force is James Currie, a Scotchman with the courage of his convictions, who has tackled his job with that sturdy common sense which characterizes his canny race, and who has but one motto, "Success."

Arabs are taught in Arabic, English being optional, and no attempt is made to interfere with the Mohammedan religion. Classes meet on the Christian Sabbath as on other days, and the teachers, many of them natives, are not disturbed in matters of conscience. The chief effort at the present time is to train a body of young men who will be able to exercise among their own people the function of minor civil magistrates, according to European standards and ideas, and to this end about 150 young sheiks—many from the desert and personally selected by Sir Slatin Pasha, whose acquaintance, more thorough and accurate than that of any other man, was gained by ten years of peril and terror under El Mahdi and El Khalifa—are now under instruction with most encouraging promise.

EDUCATING THE ARABS AS MECHANICS

There is also a manual training school in mechanic arts and a research laboratory bearing the name of its founder, Henry S. Wellcome, of London. Forty young men are now being instructed in the training school, and unless one could see and handle their work—tools wrought through all the processes, smelting, forging, and finishing, from the ore; pumps in operation, built and installed with electric motors and lights; cotton

gins set up and in successful operation—it would be difficult to believe that in two years so much could be made of the wild Arab of the desert. But here the explanation is not difficult: mechanics are in much greater demand than supply; steady jobs in the government shops and dock yards are ready for all qualified; the Arab is as keen for money as any man who lives, even in Wall street.

The Wellcome laboratories have already won recognition from the scientific world for the value and thoroughness of their work, and the first annual report, taking up the actual question of the Sudan, is already standard and classic; for the Sudan field, so far as exact scientific knowledge is concerned, is almost untouched; and here the investigators, having a free hand, take up the pernicious insects (particularly the deadly fever-spreading mosquito), the blight and diseases of plants, the ills that human flesh is heir to, and all the other manifold matters of imperative practical importance, with a zeal and a thoroughness surpassed in no other laboratory work in the world. Far up the White Nile, living on a "felucca," isolated from the world, with native servants his only companions, we found Dr Grenville Neaves, conducting under the auspices of the Wellcome laboratory hand-to-hand researches into the dread sleeping sickness which has decimated districts of the lower Congo and which will be resisted in the Sudan by every expedient known to science that exact knowledge can suggest.

Gordon College has now estate and endowments of about half a million dollars, one-fourth of which is invested in one large brick building of the Gothic order, where its classes and laboratory work are carried on, and its pathological and biological museum, under a young American graduate of the University of Pennsylvania, is located; and its classes of young Arab lads, instructed by teachers of their own faith and race, are a picturesque and suggestive sight, as one walks down the long corridors, catching glimpses of the work through the open door.

Map

"Pay as you go" is, moreover, the motto of Gordon, and, much as pupils are desired and greatly as the institution and its work are needed for the public welfare, no tuition is free. Every student is taught "that what is worth having is worth paying for." The fee averages only $10 a year. Next year a boarding school, in which the charge will not exceed $50 per year, is hoped for.

No radical or reactionary attempt is made to interfere with social customs or old, familiar usages. For example, if the young Arabs wish to convey food to their mouths with their fingers, like their ancestors for generations and their families today, they are permitted, but they are taught that the washing of hands before and after eating is imperative.

THE UNION OF THE TWO NILES

The union of the two Niles, or, rather, the refusal of the two currents to unite, never fails to attract attention and is a phenomenon which has had many explanations. For miles the waters of the two streams flow on distinct and repellent, as though a physical barrier separated them, and one can trace the division as far to the north as one can see—the Blue Nile, with its somber, almost black waters, hugging the eastern bank and taking about a third of the width of the stream, while the turbid White, laden with the light-colored soil 2,000 miles to the south, keeps steadily on its way, as though the new neighbor were unworthy of notice.

Omdurman may be reached in two or three ways from Khartum, but the best is by the little two-mile-and-a-half two-foot steam tram, which, starting from the Mosque square in the heart of the town, winds its way through the market gardens, melon and durra patches, whose owners, with their families, are sunning themselves against the walls of their Nile mud houses in the windy and chilly morning, to the ferry landing, whence a steamer with the inevitable barge soon puts you on the other side.

THE MARKETS OF OMDURMAN

The gum market at Omdurman is the greatest of its kind in the world. Here, exposed to the full rays of the morning sun and spread out on acres of mats, are heaped the treasures of the trees of the Kordofan desert, brought hundreds of miles on the backs of camels. In one corner of the great inclosure, sheltered by an awning of mats, groups of kneeling women are sorting the gum, picking it over, rejecting all foreign matter, gathering pieces of like size and quality that it may be more readily graded, and using nothing but eyes and hands for the process. Here is the raw material which makes the gum as applied in the arts and sciences in a thousand different ways—on every envelope, postage stamp, in confectionery, etc.

The silversmiths are among the most interesting artisans of Omdurman, and to them practically the whole of one street is given. A charcoal fire as big as a half bushel, half buried in the ground and blown by a crude, antiquated bellows (one was nothing more nor less than an old canvas bag with a hole at one corner, which an Arab boy regularly lifted and lowered, and with good effect, too), an anvil set in the earth, and a few small hammers constitute the workman's entire stock of tools, and with these he turns out very presentable wrist and ankle ornaments, bracelets, and finger rings, and other articles which touch the barbaric fancy of the Sudanese women. Little originality or variety, however, is expressed in the designs, and the workmanship, while creditable, considering the tools with which it is done, would not be accepted in the shops of London or New York. The Omdurman smiths are, however, fully alive to the value of their wares, and hunters of bargains are sure to be disappointed. They know the worth of the raw material in every article they fashion, and, remembering this, have a bottom figure which is immovable.

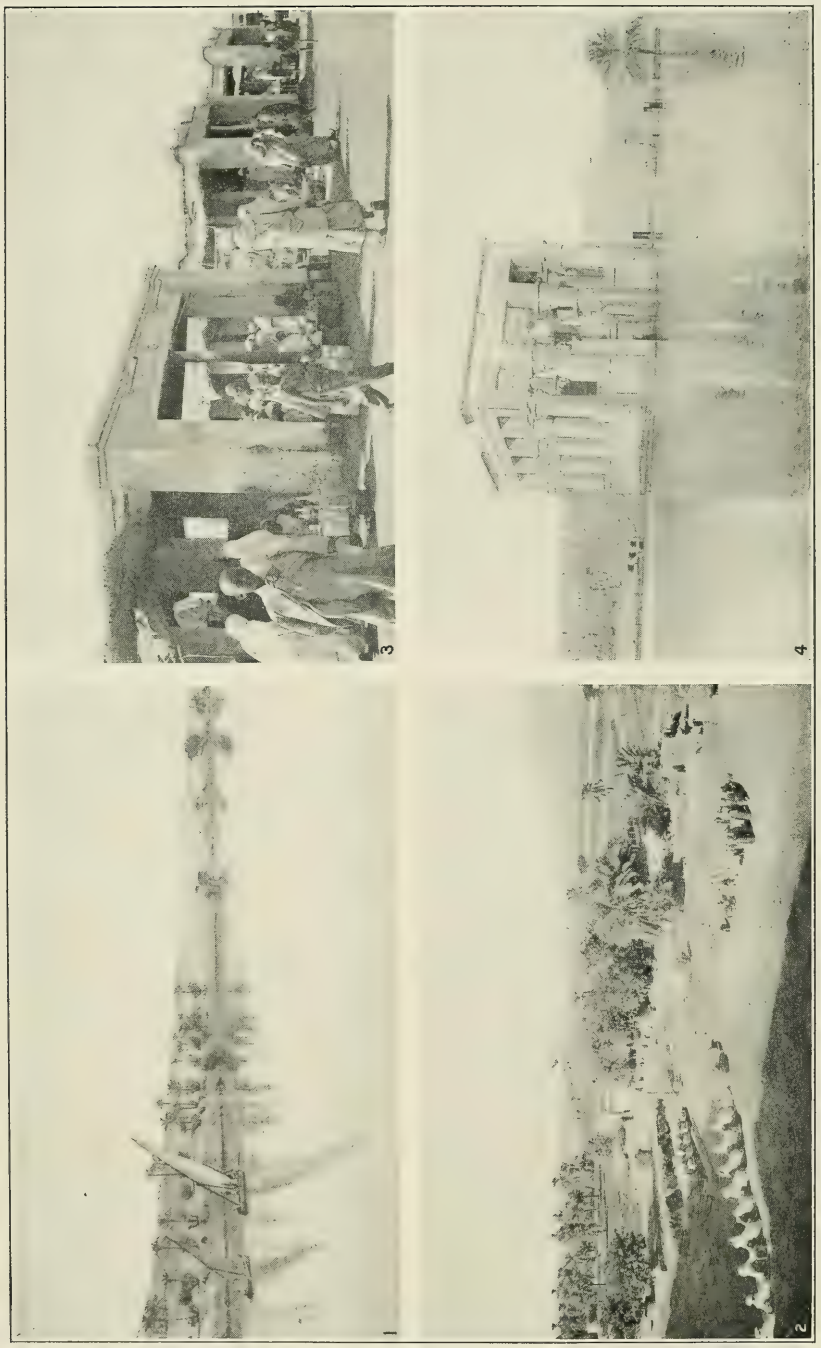
Still another interesting business center of the great Sudanese metropolis is the cattle and camel market—an extensive corral filled with live stock, except horses, which are the exclusive possession of the British officers. As we stood on its walls, surveying the busy and picturesque scene, the Arab dealers and drivers, in their white turbans and long blue gowns, moving to and fro among the animals, to the south a long string of a hundred or more gum-laden camels from Dongola crossed the near horizon, reflected in the glaring

From Clarence J. Johnston, U. S. Department of Agriculture

Plowing Land which has been Baked by the Sun

From "Present Day Egypt," by F. C. Penfield. Copyrighted, The Century Co.

Egyptian Bride going in State to Her New Home



1. Dahabeahs of the Nile
2. Avenue of the Sphinxes, Luxor
3. Street scene, Omdurman
4. Temple of Isis, Philae

mirage of noonday as if "the ships of the desert" were actually sailing on the glassy surface of a vast inland sea.

THE BERBER-SUAKIN RAILWAY

This distant region has been brought within three or four weeks of New York by the completion of the Suakin-Berber route, the "old line" from Egypt to the Sudan. For centuries camel trains and traffic went in and out this way, and it was along this route, not less than up the Nile, that Gordon looked in vain for his relief. By the completion of this comparatively short section of 250 miles from Suakin to Damen, the actual point of junction, Khartum and the Sudan have secured their own port on the Red Sea, with direct access thence to all the world, and the problem for transportation for interior Africa is solved. Today a passenger may travel from New York to Gondokoro, in Uganda, all the way by water, except for the 270 miles from Suakin to Khartum; and then, if he has a mind to walk 120 miles farther to Nimule, he may sail into the waters of Lake Albert, the very heart of the continent and the source of the Nile.

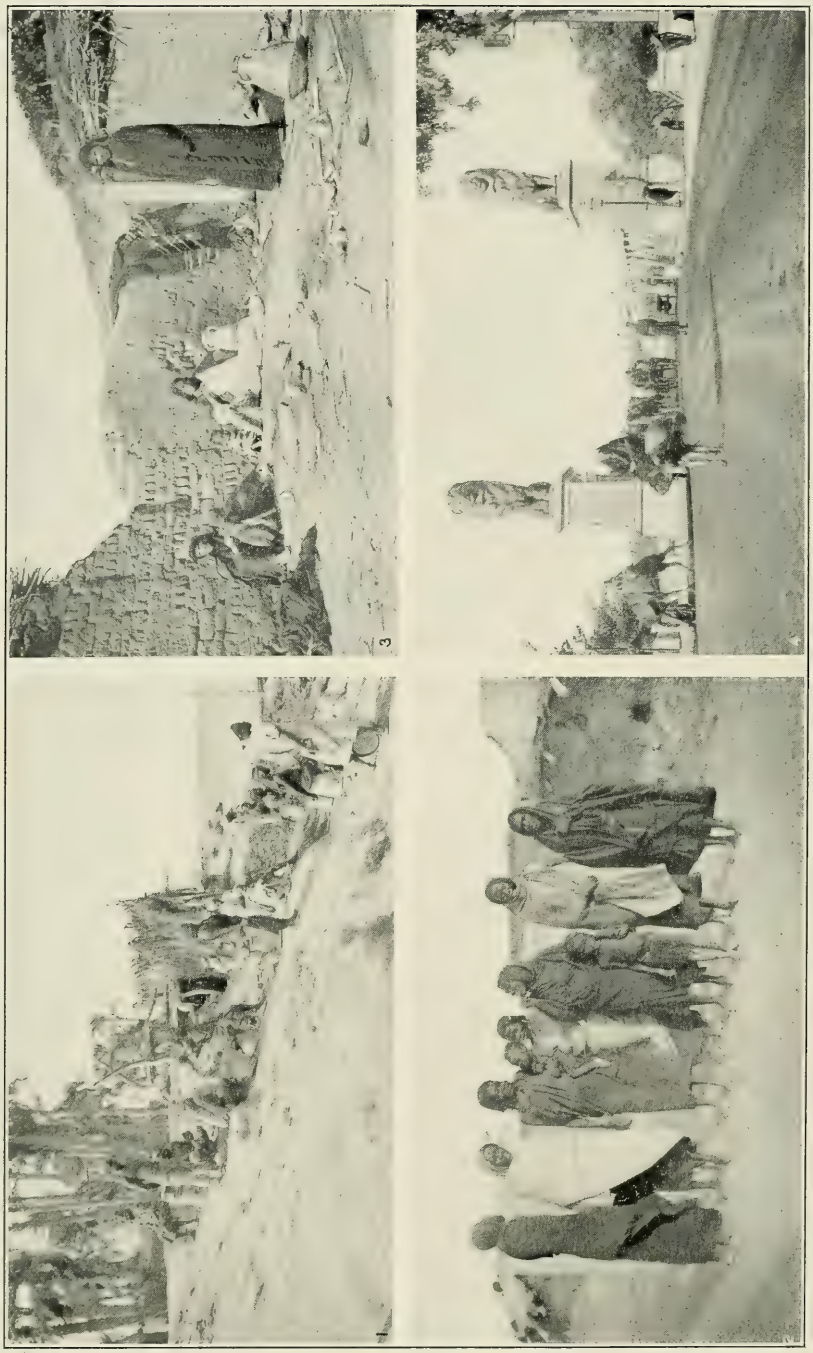
It is impossible to exaggerate the commercial importance to the Sudan of the new line. Its opening has been hailed with eagerness as the beginning of a new era, not so much because it will reduce the time of passengers and mails from home as because it will solve the fuel question and permit Welsh coal to be laid down at living prices in Khartum—a condition which will at once affect the whole question of interior transportation. All classes of freight will feel the effects of the change. Politically also the consequences will be momentous, though just how soon they become effective is a matter for Lord Cromer and his associates. The new line will minimize, if not wholly eliminate, the Nile as the way to the Sudan, and will accelerate that substantial autonomy and independence of the provinces which is so much to be desired.

A Water-carrier, Khartum

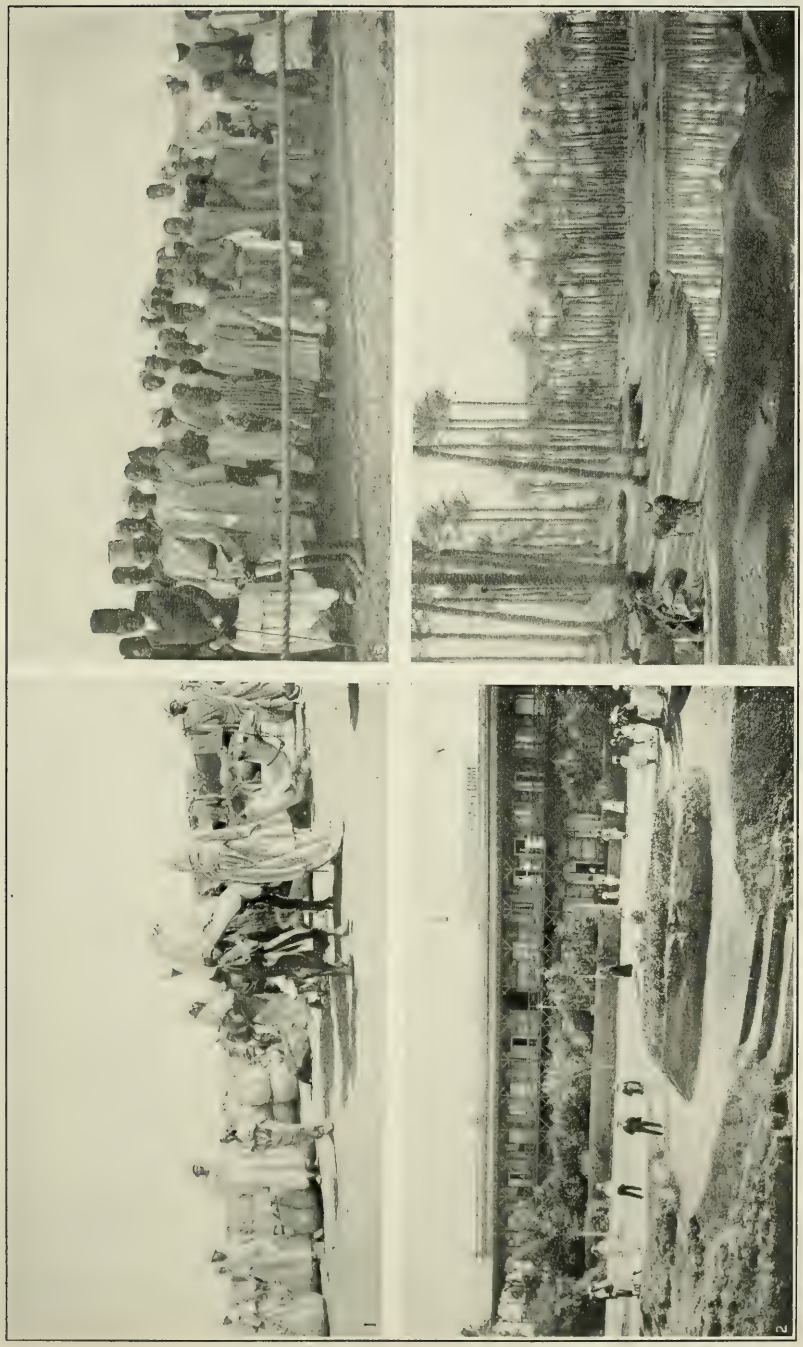
TRAVELING UP THE NILE FROM KHARTUM

Like ancient Gaul, the White Nile and its country readily divides itself into three parts. The first, longer and larger

A Fruit Seller, Omdurman



1. Bank of the Blue Nile below Khartum
2. Arab Suburbs, Khartum
3. Bisharin Arabs, Omdurman
4. Kasr el Nil Bridge, Cairo



1. Arrival of the Kodofan Camel Train, Omdurman
2. Grand Hotel, Khartum
3. Watching the Polo Players, Omdurman
4. Between Blue and White Niles, Khartum

than both the other two, from Khartum nearly 600 miles to Lake No, the junction of the Bahr-el-Ghazal and Bahr-el-Jebel, is the arable and pastoral land, the home of the Shillook; then come 300 miles of swamps and sudd, and beyond is the solid earth again, the real tropical jungle, the haunt of the Dinkas, elephants and lions, until between vertical banks the voyage comes to an end under the bluffs of Gondokoro. Of course, in this thousand miles there's a good deal to see, and ample time is allowed in which to see it. To the first stop, for example, El Duem, is 110 miles, and the running time is 31 hours.

All the way to El Duem the Nile broadens out into a series of lakes much

Girls at Omdurman

more expansive than below Omdurman, dangerously shoal in some places, and occasionally showing low islands, not more than a foot or two above water at their highest point, which are eagerly seized on and subjected to cultivation by these riverain Arabs, who seem possessed with a genuine and chronic "land hunger."

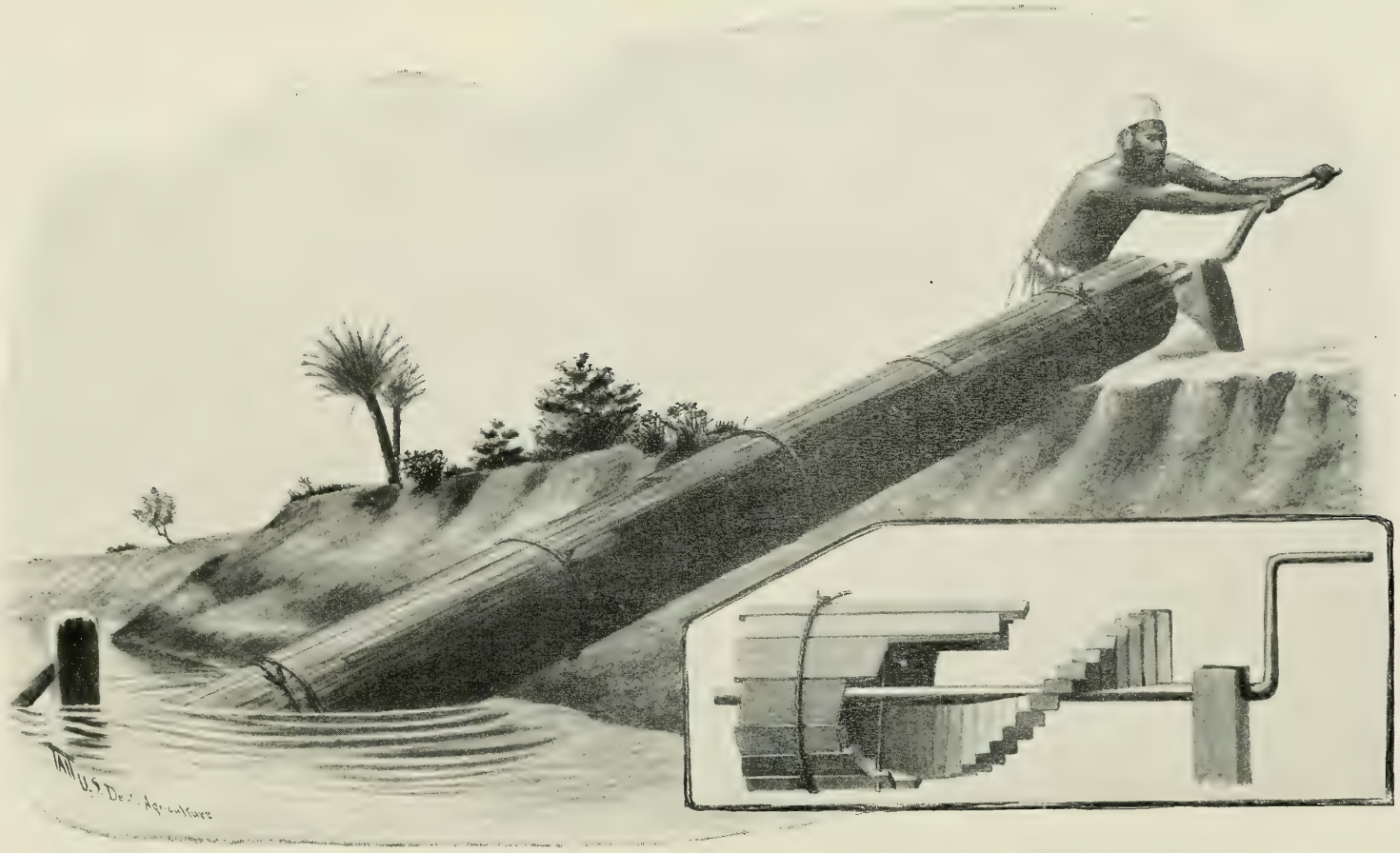
For the first hundred miles the desert on either side and the high profile of mountain ranges beyond, as on the Egyptian Nile, is plainly visible, the foreground being filled, wherever a foothold can be found, with green fields, solid with dense bush vegetation, while the *shadoofs* or swinging buckets, with which irrigation is performed as it has been for thousands of years, are numerous, many being absolutely new and working for the first season.

El Duem (in English, "The Two Camps") is a town with a good deal of history already made, and, if signs do not fail, likely to make a good deal more of a better sort in the early future. Port of Kordofan and its great gum trade, was the Mahdi's base of operations more than twenty years ago, when he set out on his crusade which was to end at Mecca and which devasted his own country, and was the first rallying place of the Khalifa, years later, after the rout and panic of Kerreri. It has been selected as the point where the new railroad from Omdurman is to turn off to the westward for El Obeid, the Kordofan capital, and its position must insure to it the importance which always belongs to towns commanding both land and water transportation. A stroll through the town shows that it is much like others of the Arabs. Low Nile-mud one-story houses line the narrow streets, which, however, boast a few kerosene lamps and wooden lamp posts at the prominent corners, and further evidence of modern improvements is given by the policeman who, laying vigorously about himself with a whip, charges a crowd of a hundred ragged and dirty urchins crowding around the English ladies and blocking their way so that progress is almost impossible. In the main street, sitting on the ground, a young Arab operates an American sewing machine; empty Standard Oil cans, now used instead of water jars, and a cheap iron safe or two are all evidence that even in this remote and interior point something of the great outside world has begun to filter.

By the third day the Nile begins very sensibly to narrow and the character of the country to change. Cultivated fields disappear, the mud villages grow fewer and far between, and the verge of the boundless, illimitable forest is seen to be not far away. From the deck of the steamer, what is called the forest looks more like a vast orchard of civilized trees

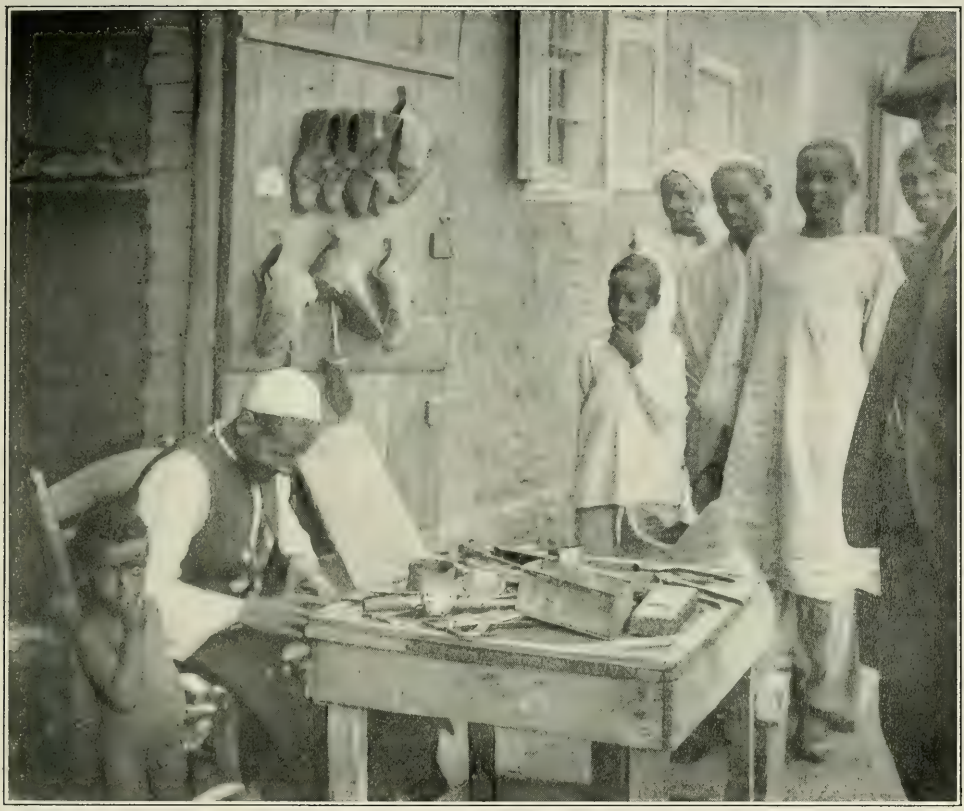
From Clarence J. Johnston, U. S. Department of Agriculture

Raising Water from the Nile by Means of the Shadoof



From Clarence J. Johnston, U. S. Department of Agriculture

Raising Water from the Nile by Means of the Archimedean Screw ; interior construction at right



A Cobbler on the Street, Khartum

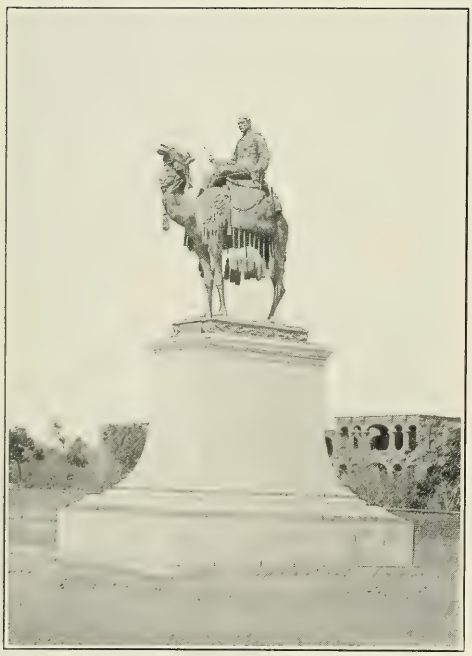
of moderate height with spreading leafy tops and to a great degree entirely free from undergrowth. The utter absence of every representative of our fir, spruce, cedar, or balsam also conveys an unusual impression. While the African forests contain an abundance of trees always in green foliage and the multi-colored tints of our autumn are never known, there is not a solitary example of the beautiful "evergreen" which adorns every Adirondack slope and flourishes, dwarfed and stunted, to the farthest Labrador. Wooding stations, each very much like those which have gone before, fill the time, but do not break the monotony, until Fashoda, after we have been at sea almost a week, is reached. By this time we are in the heart of the Shillook country, and the Arabs and their little veneer and fringe of European civilization seem as far away as Paris or Madison Square.

THE SHILLOOKS

The Shillook, tall, lithe, and usually wearing only a string of beads, frequently not even that, is a true child of nature. With head plastered with red mud and body with wood ashes, he toys with his murderous spear, surveying the newcomer, and one is inclined to treat him with every outward appearance of respect. Shillooks are plentiful long before reaching Fashoda; but this is their capital, and about a mile south of the port is a large collection of their tukhls, or houses, among which the king makes his

Palace of the Sirdar, Khartum

headquarters when he receives from his followers the taxes he hands over to the British commander. The Shillook further enhances his own dignity and appearance of indifference by standing on one leg while the sole of the unused foot is pointed at right angles above the knee of the leg in service, the two describing almost exactly a figure 4. Braced by his long spear, the Shillook will stand for hours in this position, and no power on earth apparently—other than that of the almighty dollar in almost any form—is sufficient to induce him to unfold and move. Much difference of opinion exists as to the industrial value of the Shillook. The officers say that he is too lazy to work, to talk, actually even to smoke, preferring to hand the pipe to a wife or female to keep it alight, that an occasional puff may be enjoyed, while the missionaries speak with hope of encouraging results.



Gordon Statue, Khartum

Cattle are the currency and cattle-raising the great industry of the Shillooks, and their herds of thousands range over the level luxurious valleys, almost concealed by the tall grass. The stock are a worthy lot, all colors and sizes, and evidently a skilled American breeder could ask no more inviting field. Shillooks never kill cattle for any purpose whatsoever, though those which die a natural death are eaten. They are used to buy wives, six or eight cows for a woman, with the privilege to the buyer of return in reasonable time if not satisfied. The American missionaries here are giving the natives valuable instruction in the

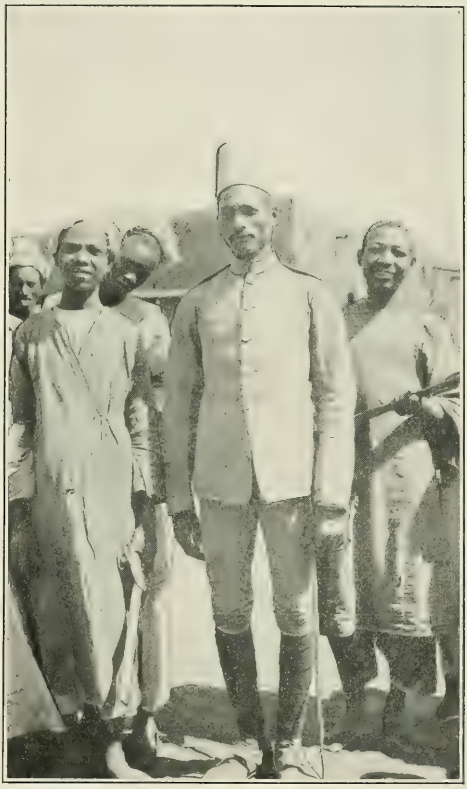
raising of cotton, using the best Egyptian cotton seed for stock, sweet potatoes and other crops adapted to the rich soil and kindly climate of the Sobat, with excellent prospects of desirable results. The Sudan has promised to allot the mission a considerable tract of land along the river.

WILD GAME OF MANY KINDS

Animal life on the White Nile is abundant, and hunters are constantly traversing it for what they call sport. "Hippos" are so numerous that after the first few days only an exceptionally large or fully exposed herd will induce the unlimbering of cameras; crocodiles are likely to be sunning themselves on every sand spit and are the only game which may be shot from the steamers without penalty. The presence of ivory tusks at the trading stations proves the proximity of elephants, and early risers may be fortunate enough to see two of the big fellows smashing along in the tall grass within easy rifle shot. Waterbuck in droves, antelopes in herds, gazelle singly but in great numbers, and monkeys too numerous to mention may all be observed in a single morning by sharp eyes, and once in a while the stately and ungainly giraffe makes his way with the rest of the animal creation to the Nile for water. All of these animals can be hunted only upon payment of heavy license, and the giraffe is absolutely protected against sportsmen on any terms—conditions which in British territory are rigidly enforced. Birds of many species familiar to the north wintering in the tropics; frequent flocks of geese flying in military formation; of ducks feeding on the aquatic plants, and a great variety of all the water fowl—cranes, herons, divers, ibis, and others—are frequent, while on the topmost branch of many a lonely tree the stately fish eagle in solitary dignity is a familiar figure. In the river also are treasures of life, as the continual succession of fishermen's huts, almost hidden among the reeds, proves. Hither the natives come and catch and cure, while the season is on, supplies for a long time—the only thing resembling work which they are known voluntarily to undertake.

FASHODA

Fashoda has the deserved distinction of being historically by far the most interesting place on the Nile south of Khartum. Physical circumstances have much



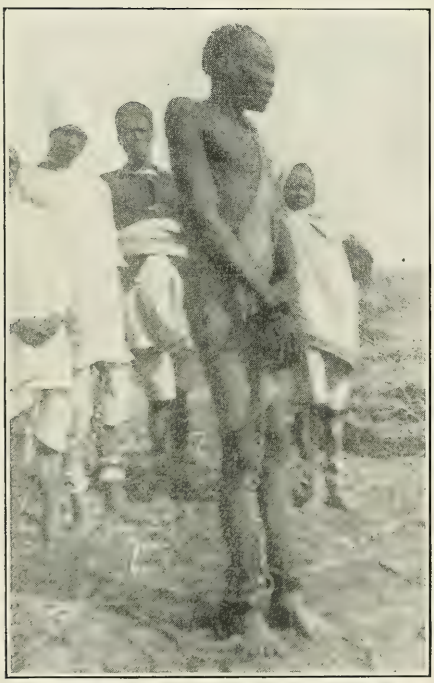
A Sudanese Policeman, Khartum

to do with this, for it is the last place on the west bank which can by any courtesy be called high land, on which a town could be built, before the great swamp of the "sudd" and the but lately unexplored country of the savages to the south is encountered. Here Baker, in 1871, found an Egyptian force and station, and on returning three years later, at the end of his campaign for the suppression of the

A Parade of the Shillook Regiment in Honor of Princess Beatrice, Khartum

Shillook Warriors. (See pages 255–256)

Advancing Through the Sudd. See page 263



Group of Convicts, Fashoda

slave trade, 700 human chattels, slipped through by the scarcely concealed cognizance of his royal master, Ismail Pasha. Here Emin Pasha took his leave of civilization when entering on that maze of experiences, a mystery even to this day, from which Stanley almost by force rescued him, and here only a few years ago Marchand from the westward debouched on the Nile, expecting to find men and arms from Abyssinia with which an alliance might be made to permanently check the British progress up the great river.

The name Fashoda has disappeared from official maps, documents, and publications, and Kodok, which suggests an American advertising opportunity, been substituted; but Fashoda it is in all the common speech of men everywhere and Fashoda it seems likely to continue.

It is interesting to note that the moral effect of the Kitchener-Marchand incident was most remarkable in all Egypt as determining finally the dominant power and indicating to what nation the future

of the continent was to be entrusted. The proportion of French pupils in the public schools of Alexandria dropped from 80 per cent to one-fourth that number, while that of English gained in exactly the same ratio, perfectly voluntary choice being allowed.

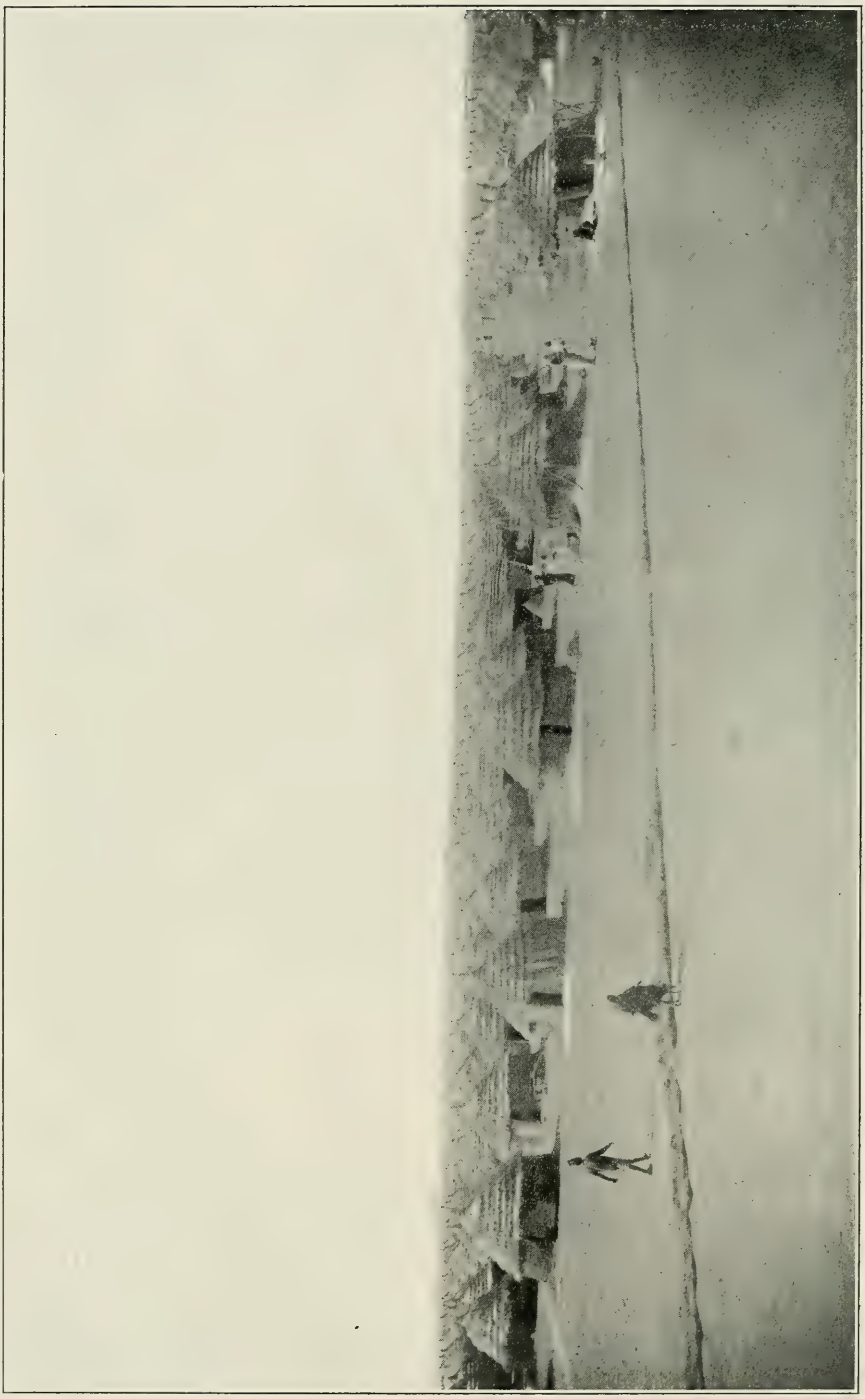
Fashoda, in spite of its history, is not well located, and one is rather inclined to commiserate the officers who are obliged to keep up the post as the chief of the province. The Nile at this point divides in three, and only at the highest stages can landing be effected. We were obliged to go ashore on the central island, cross it on muddy paths, and then were poled over a second shallow lagoon in a crowded boat, while the natives and permanent residents waded.

Tewfikieh, 70 miles farther up and on the other side of the river, is much more eligibly located, and from the extensive improvements which are going on there, many new buildings being erected by the government, it would seem quite likely that it may become the capital of the province. Tewfikieh is also very convenient to Sobat, which enters the Nile from Abyssinia only four or five miles above the town, and is charged with its protection, now that the old fort at the junction of the two rivers has been abandoned. The Sobat, it may be remarked in passing, is a river with a future. Traversing a highly fertile country for hundreds of miles, navigable without difficulty, it seems certain that it must come rapidly to the front, and the new trading and missionary stations soon to be established along its upper shores are the best guarantee of the fact.

Types of Natives, Gondokoro

THE DESOLATE "SUDD" COUNTRY

Not far above the junction of the Nile and the Sobat, the scene changes and the great swamp, the country of the sudd, a

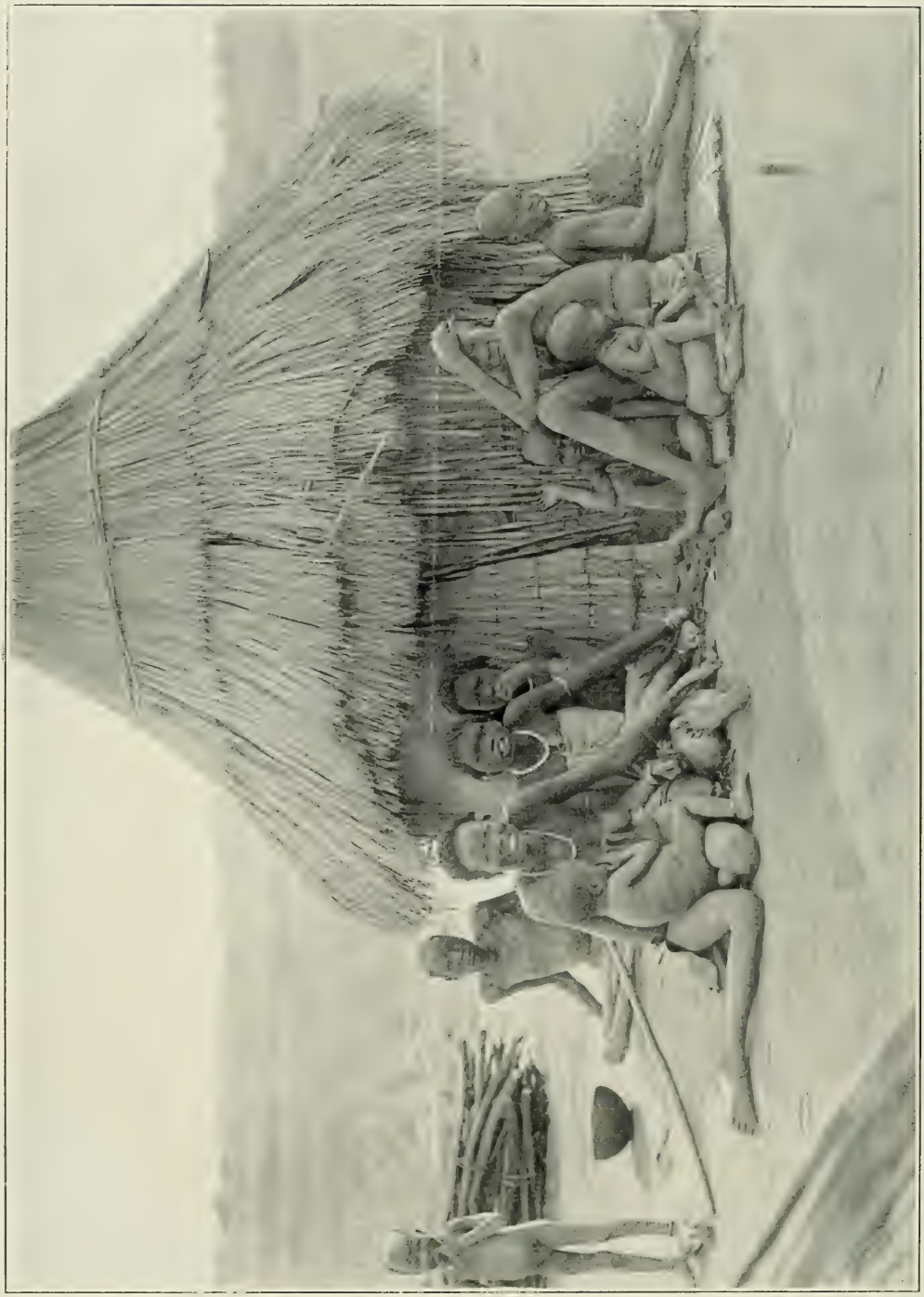


General View of Tewfikieh

One Thousand Miles up the Nile from Khartum

vast lake hidden under vegetation, is entered.

So much has been written and read about the swamp and the sudd of the Nile, which have for years together blocked navigation, that it may be superfluous to attempt another word; yet, like some other things of this life, these must be seen to be appreciated. Almost before one is aware of it the steamer enters a lane, hardly more than wide enough to admit it, lined on both sides with papyrus as high as the after deck and among which the water may be seen moving sluggishly. On the hurricane deck the view is more extensive, but without interruption or mitigation. In every direction as far as the eye can see stretches a boundless level expanse of green, so dense and solid that any casual breeze makes no motion, and unbroken by tree, dry land, or any other thing to vary the deadly monotony. Compared with this dead sea of green, the open ocean, far out of sight and land, is action, companionship, and inspiration. As the steamer passes along the zigzag channel, all signs of life—birds, insects (except the deadly mosquito), and every other moving thing—are left behind, and only the color of the papyrus prevents one from saying and writing "the abomination of desolation." The papyrus, which has practically exterminated all other vegetable growth in the swamp, lays claim to more literary distinction than it deserves, though it is by no means an ungraceful plant. Any one who recalls the common broom corn of the Connecticut and Mohawk valleys and the Illinois prairies may get a very good idea of the papyrus if he will simply imagine the stalk triangular



Nearing the Equator. A Village Scene at Bor

instead of round, and the "whorl" at the top spreading in all directions and seedless. As the boat pushes its way, the ripples of the water set the stalks swinging and the spray-like heads swaying in a picturesque manner; but other than this, motion is unknown. Of course, under the tropical sun the growth is rapid, and decay equally speedy. So the process of reproduction goes incessantly on, and all the activity and energy of man is required to keep the navigable channels open.

The course of the river through the swamps is tortuous in the extreme, and that the right channel can be kept, where there are two or three others which, to the untrained eye, look exactly like it, seems little short of marvelous. The distance traveled by the steamer from Khartum to Gondokoro, 1,150 miles, is about 300 miles more than that of the air line, the greater part of the excess being accounted for by the winding channels of the great swamps.

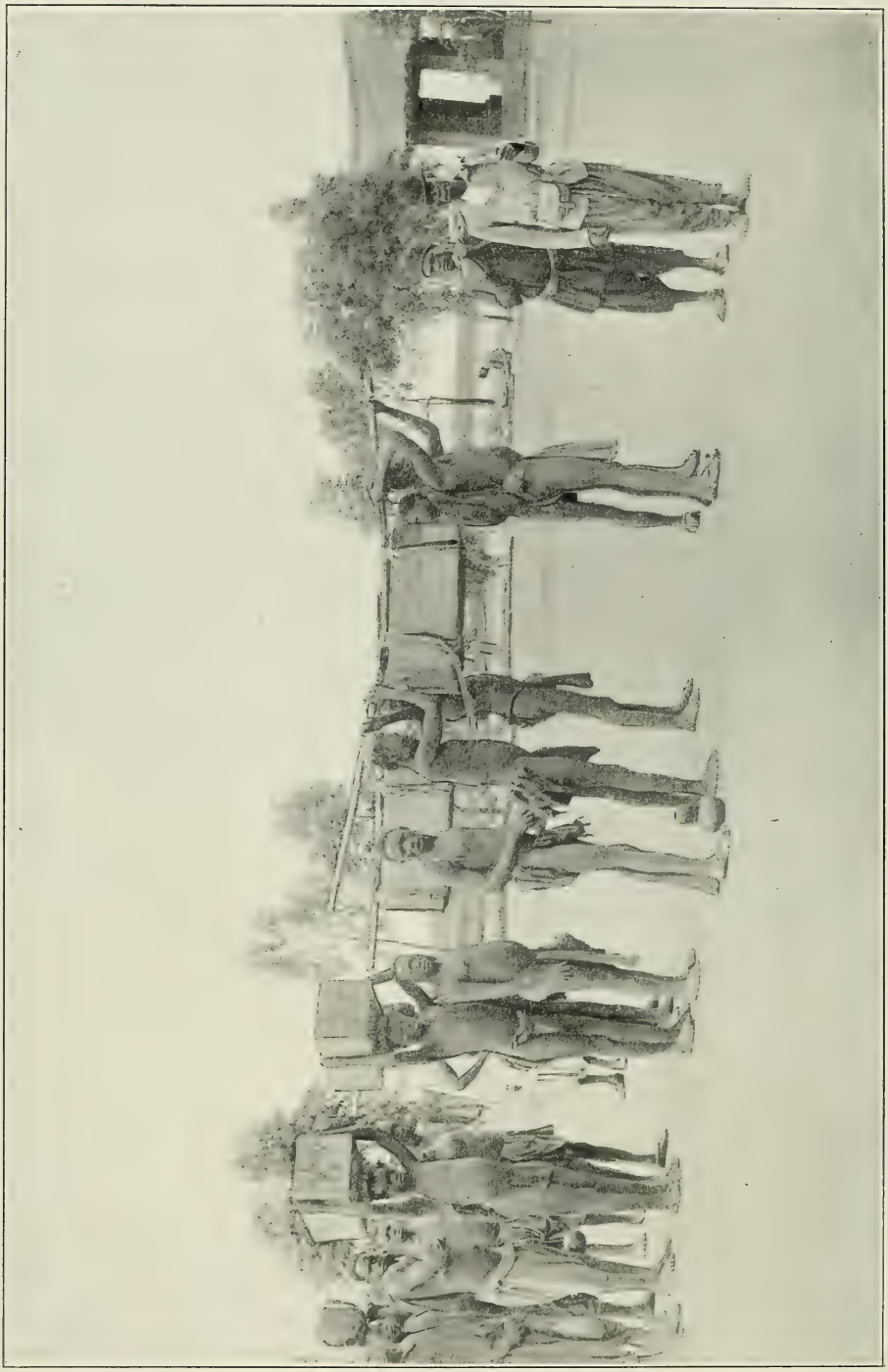
Cutting out the sudd, the blocks of papyrus, and other vegetable growths has been vigorously prosecuted by the Sudan government, and this season will see the last obstruction removed and the true channel opened from end to end.

At Bor, 1,071 miles from Khartum, established by Gordon thirty years ago as an Egyptian outpost, and now a wooding station, dry land appears, and one realizes how Noah must have felt after his memorable experience. The banks are low, not more than ten or a dozen feet high, but the everlasting papyrus disappears, tall reeds and waving grasses line the river, here not more than 50 yards wide, and in the near distance, over the rank vegetation, can be seen the tops of the forest trees. Conditions become more definitely tropical, and the shores often look like the true jungle. Wide-spreading trees droop festoons of vines, the queer inverted umbrella-shaped *euphorbia* becomes frequent, great cacti show themselves on the dryer spots, and altogether a world of wholly new flora is opened. The current is swifter, but the channel no straighter, the *Dal* and her two barges often lurching up like a drunken man unsteady in the gale against the bank, compelling her to back off and pull out as best she may. Less than a hundred miles remain of the journey after Bor, but it is all interesting and along a historic course.

LADO

The morning approach to Lado is particularly impressive when the sun lights up the great pyramidal Lado Mountain, which rises sheer from the plains 3,000 or 3,500 feet, a sight doubly welcome after the dead levels of the river country and the watery wastes of the swamps. Beyond Lado 20 miles through a pleasing and apparently fertile land the *Dal* pushes against the swift current until she moors against the steep banks and under the overhanging trees of Gondokoro, Baker Pasha's old Ismailia of more than 40 years ago. We are at the head of navigation on the Nile, unless that distinction may be allowed to Redjaf, the Belgian post 20 miles farther up, which runs a little military dispatch boat, with a flag several sizes too large for it, to Lado once or twice a week for officers and mail. Beyond Gondokoro east and south the mountains rise, outposts of the great Central African ranges, from which come the streams feeding Albert and Victoria lakes, and one really turns again toward the North Star and home with a sense of regret that the inviting journey southward may not be attempted; for there is a perfectly practicable post road for mails and porters 120 miles to Nimule; thence by boat to the head of Albert Edward Lake, and again on foot overland to the western terminal of the Uganda Railway, by which the Indian Ocean and all the ships that sail it may be reached at Mombasa.

By an arrangement which seems generous to the verge of safety and more liberal than precedent warrants, Great Britain during the remainder of the reign of King Leopold waives jurisdiction over the Lado enclave and yields to Belgium



The Mail Leaving Lado for Stations in the Congo Free State

use and occupancy nearly three hundred miles front on the west bank of the Nile and an approximately average equal distance from the river into the interior.

In the meantime the use of the Nile front is to Belgium almost indispensable; she is permanently strengthening the upper part of the Wadelai, though no one supposes she will be so foolish as to fight for it, and makes the Nile route the way for her officers going and returning and for the transaction of their personal business, notwithstanding that the mails still go by the overland Atlantic route. The difference is one month to Brussels by the Nile, against three or four by the Congo, and it's no wonder that every officer taking leave chooses the former.

Enough has already been ascertained to make it certain that the future of the Congo must be as an agricultural state. She may look with confident certainty to rubber, sugar, and cotton as staples, but of mineral wealth there is doubtful encouragement. Gold in paying quantities is known to exist in the southern province of Katanga. Iron ore is found in many places of satisfactory quality and well located for development, but both the coal and the limestone for smelting are so far lacking, and until iron becomes much scarcer in other countries or transportation will permit importation of fuel and flux, it is not likely that the Congo steel trust will amount to much. As an agricultural country, however, its consumption of iron will not be large and the situation is not one of much economic importance. The mineral survey has a good deal of unexplored country yet to examine, for it should not be forgotten that the Congo Free State covers nearly ten million square miles, being twenty degrees of latitude from north to south, or would be if its salient or re-entering angles were straightened out, and years must necessarily elapse before its full condition and capabilities are known. Many believe that in the gold of the Katanga alone Belgium has in the Congo a prize which may some day rival the great wealth of the South African Rand.

Of course, brief visits, largely formal and superficial, do not qualify for any authoritative opinions on the Congo outrages of which so much has been said.

Impressions, however, may be taken for what they are worth, and certainly not only what was seen, but what was heard at Lado and Kiro was distinctly and altogether favorable. Everybody, particularly the black soldiers and their women, looked contented, well fed and clothed and happy, and a better-looking lot of men and women could not be mustered at any British or American military outpost. If they were oppressed or badly treated they certainly had a most effective way of concealing all signs of it, and the wholesale re-enlistment confirms the favorable conclusion. British sportsmen who have traveled widely in the Congo tell the same story of good order and content at every post.

There is, however, an evident deep-seated, probably ineradicable, opposition among many Englishmen to the permanent establishment of the Belgians in the Congo, and they look eagerly for any change which will drive them out of the Lado enclave and restore both sides of the Nile, from the Mediterranean to the Equator, to the British flag. Especially is the feeling strong among the missionaries, who complain of undue favoritism to the Catholics in the Congo, and who, when they let themselves go, predict that this change will come of necessity and at no distant day. "The Belgians," they say, "are no colonists, as we are, intent on the national development and permanent growth of the country. Their whole Congo enterprise, stripped of high-sounding names, is simply a great trading proposition, rubber the loot and the natives meat, and when they have got all out of the country they can they will simply scuttle, and we shall have to take it over or it will revert to savagery." But this is probably an extreme view or, still more likely, the wish is father to the thought.

THE "BREAKING UP" OF THE YUKON

By Captain George S. Gibbs

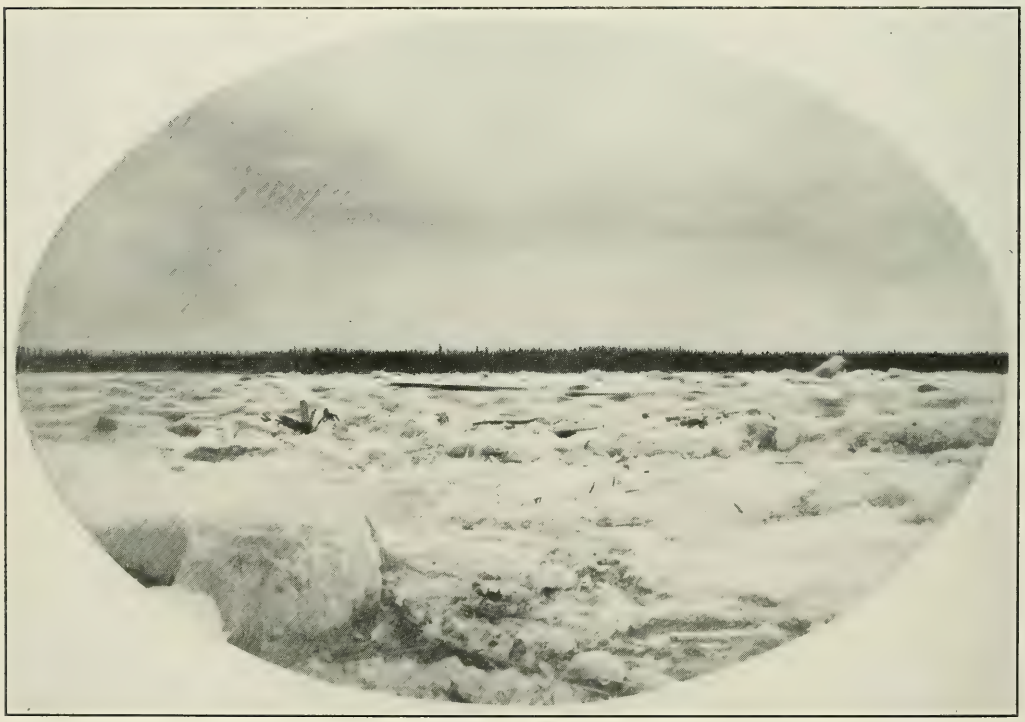
Signal Corps, U. S. Army

LONG after the cold days of arctic winter have given place to continuous day, with warm summer breezes and still warmer summer sun, Alaska still requires an all-important finishing touch to usher in its "open" season—that is, the clearing out of its mighty highways, the rivers, of the ice that for seven months has borne its sledge trails.

How anxiously this great event is looked forward to by the long-imprisoned inhabitants and the feelings of freedom and relief that it brings can only be understood by those who have participated in the celebration of this occurrence at the scattered settlements along the thousands of miles of Alaska's great rivers.

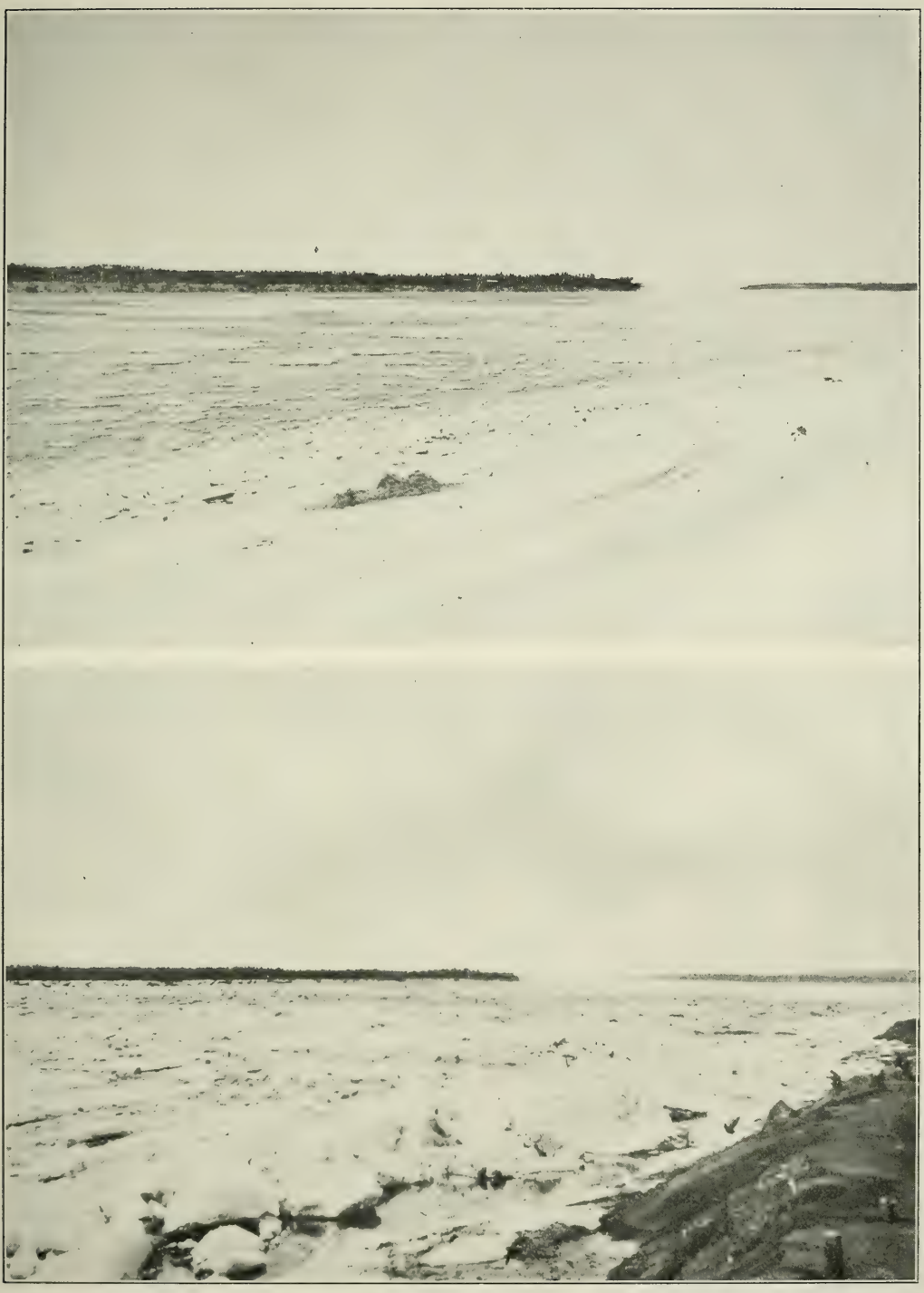
The shutting-in process in the fall is gradual. The level of the water drops daily; the ground is covered with successive snows, and patches of ice coming out of the small streams amalgamate upon the broad surface of the river into larger floes, which become larger and thicker with the lowering temperature and cementing snows, until some day about the first of November a great mass is stopped against the head of an island and in a few hours you can walk across on a solid and safe footing.

The break-up in the spring is no such



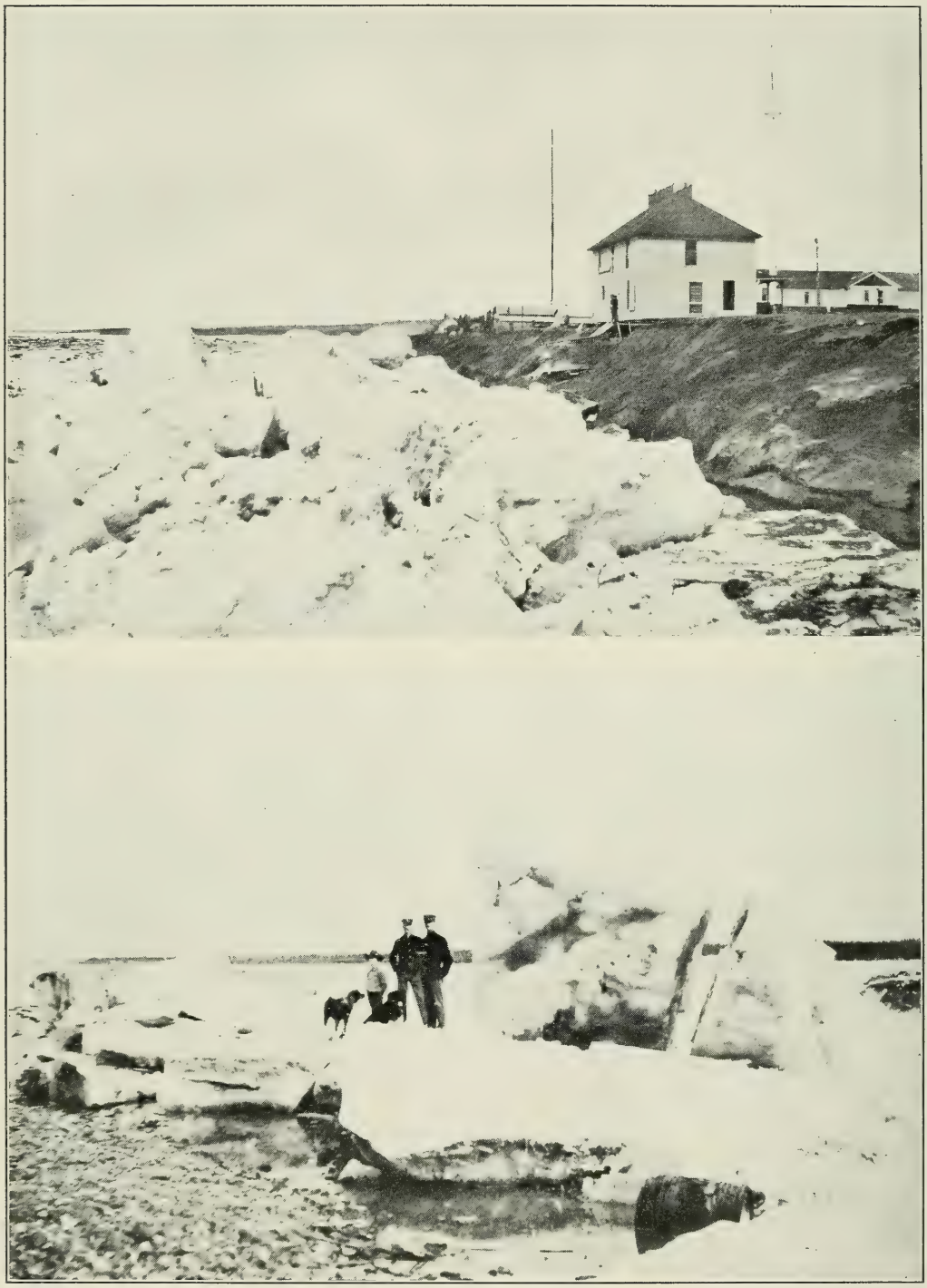
The Yukon River "Breaking up"

An irresistible torrent of more than three million tons of water per minute. Photo by Sergeant Moore



1. This picture, taken at Fort Gibbon late in October, shows the extreme low stage of water, and the surface of the Yukon becoming choked with gathering floes of ice. Photo by the author

2. Taken on the 23d of May from the same point as No. 1, during the outward rush of the ice. Photo by the author



1. The bank of the Yukon at Fort Gibbon being piled high with ice. Compare the size of the chunks with the man on the bank. The large chunk on the left was rearing like a gigantic monster as the picture was taken. Photo by the author

2. Immense chunks forced by their fellows far up on the bank. Photo by Mr R. Pfund

Destruction wrought by the Ice Floe. Photo by Major Greene

tame affair. By the first of May the days have become long and the sun hot, and soon the snow, which has been growing scarcer and dirtier, has mostly disappeared. How strange, then, that the general appearance of the great, silent river has changed but little! Its torpid, frozen length stretches along between banks already green and fresh with budding leaves and spring flowers.

As May advances, every small stream contributes its share of a mighty volume of water; and then, following along either bank, a narrow stream covers the shore ice. Meanwhile the main body of ice has been raised several feet by the swollen flood beneath it; and that, with the gnawing action of the water along the bank, at last loosens the hold of the ice upon the shore.

Apparently ready to move, the ice may not start for days; but finally the rising tide will carry away a section from the main body, and then the demolition begins. A dark pile of refuse out on the ice, or other reference mark, is seen to move, and a shout from a watcher brings every human being to the river bank to witness the rare spectacle.

At first the great body of ice, five feet thick and a half mile wide, moves down intact; but soon a bend is reached, or the channel divides, and, with a mighty roar that can be heard for miles, this great mass is shattered. Blocks of ice weighing many tons each rear and dive and grind and roar like huge monsters in a deathly panic. They crash into each other, gouge out and carry away yards of the river bank, and crush any obstructions in their path. At the meeting of every bend or shallow immense chunks are forced by their fellows far up on the bank and in places form piles as high as a house. When once out on the bank and free from the seething flood, these great ice chunks, lying on the warm earth in the hot sunshine, seem as strangely out of their element as fish thrown out upon the burning sand to die. There they lie until they become whitened bundles of slender lance-like crystals whose invisible bonds

at last break and let them fall with a musical crash into countless disappearing fragments.

For many days the ice runs. The upstream branches are cleared first, and steamboats and smaller craft follow closely the retreating ice. Some daring travelers have tied their boats to large chunks of ice in order to take advantage of the greater speed of the under current.

It is usually past the middle of June before the mouth of the Yukon is free from ice, and the termination of the annual break-up is announced by the "chug," "chug," of the welcome upcoming steamboat, laboring against the current.

A most beneficent phenomenon accompanies the spring "break-up," with its outrushing flood of more than three million tons of water per minute. During the extreme high stage of water, which lasts for perhaps two or three weeks, great sections of the heavily wooded bank are undermined and swept away. The majestic spruce trees and tamaracks and birches which covered them topple over and are swept down by the current, along with immense quantities of driftwood from the forest beds. The entire accumulation, amounting to thousands of cords of wood, is discharged into Bering Sea, whose restless waves and shifting winds scatter this fuel and pile it up on barren shores hundreds of miles distant.

The prospect presented by these arctic shores is as bleak and desolate as can be imagined. The landscape is destitute of timber as far as the eye can see, and the inhabitants of that inhospitable region have had occasion to be very grateful for these peculiarly valuable contributions from the distant valley of the Yukon.

MOUNT VESUVIUS

VESUVIUS has been violent many times since the notable eruption of 70 A. D., when Pompeii and Herculaneum were buried, but the eruption of 1906 will rank among the most destructive. Many villages were overwhelmed by streams of lava and falling ashes, so that years will elapse before the country recovers from the devastation. The mountain is reported to have lost about 800 feet in height, but it does not take the volcano long to rebuild. Vesuvius has now been watched for about two thousand years, and we are better acquainted with it than with any other volcano, but its actions are so mysterious that practically nothing is known of the causes which make it break out at intervals with such violence.

No five years in history have been so noted for volcanic disturbances as the years 1902-1906. The explosion of Mont Pelée, which destroyed 30,000 people; the eruption of Santa Maria in Guatemala a few months later, which likewise swept away thousands of people and wrecked many miles of fertile plantations; the activity of Colima in Mexico, and of Mauna Loa in Hawaii, and now this latest eruption of Vesuvius, form an unprecedented series of disasters. They serve to emphasize our ignorance of volcanic action; and yet this ignorance is not to be wondered at, for no systematic study of volcanic action has ever been made. Commissions have been sent to study individual volcanoes—Vesuvius, Mauna Loa, Krakatoa, Mont Pelée, etc.—but no prolonged comparative investigation has been made of all of them. Probably no field of scientific inquiry would yield such valuable results as a careful study of the volcanoes of the world.

Near the shore west of Naples is Monte Nuovo, or new mountain, a hill 440 feet high, cast up by volcanic action during a few days in September, 1538. All about it are volcanic hills of earlier origin, and two islands bordering the bay are also volcanic.

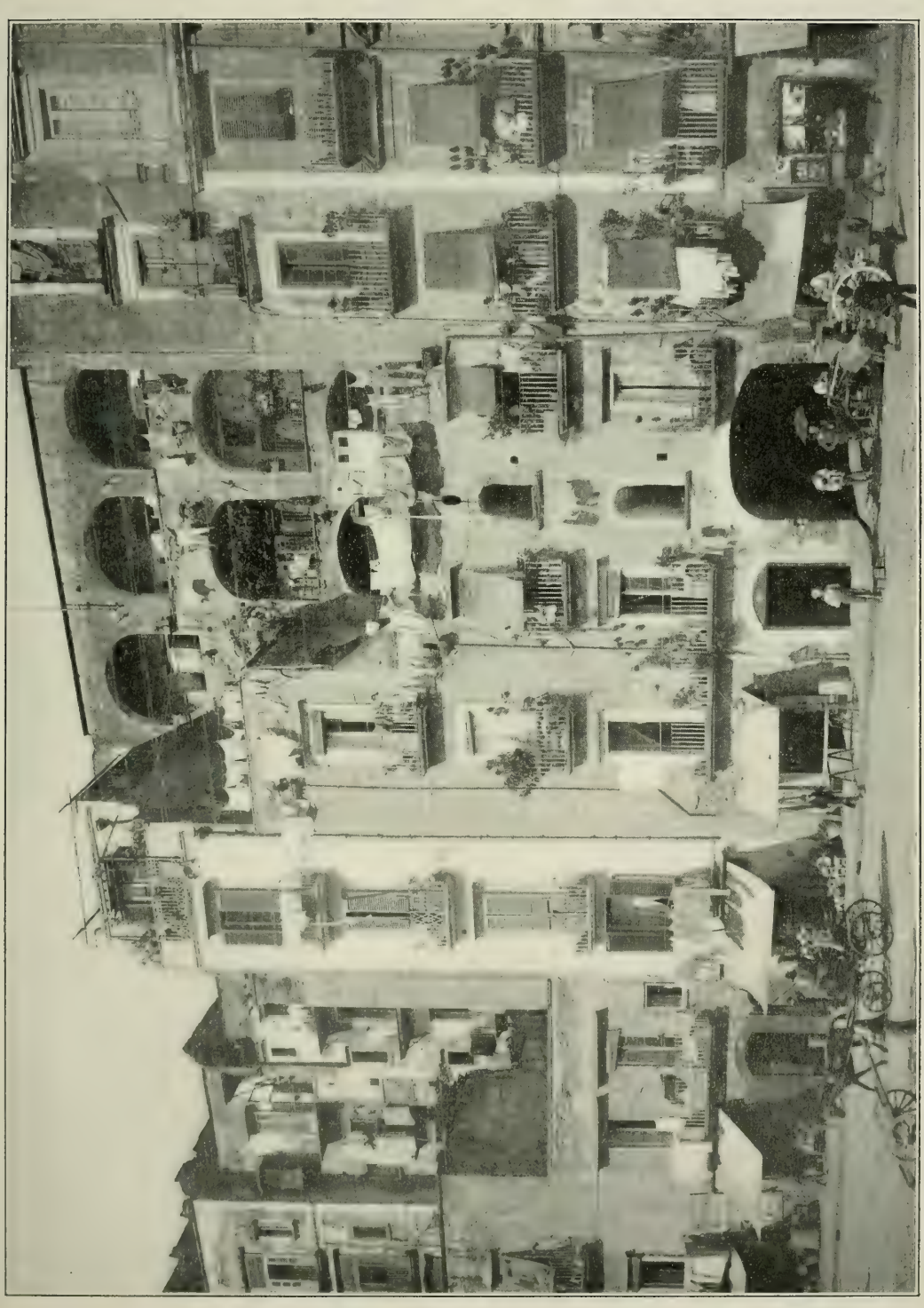
About 150 miles south of Vesuvius is Stromboli, which is always active and is

A Street in Naples

Photo from Mrs Gardiner G. Hubbard

Photo from Mrs Gardiner G. Hubbard

Naples and Vesuvius. The lower cone is called Mount Somma



Houses in Naples

Photo from Mrs Gardiner G. Hubbard

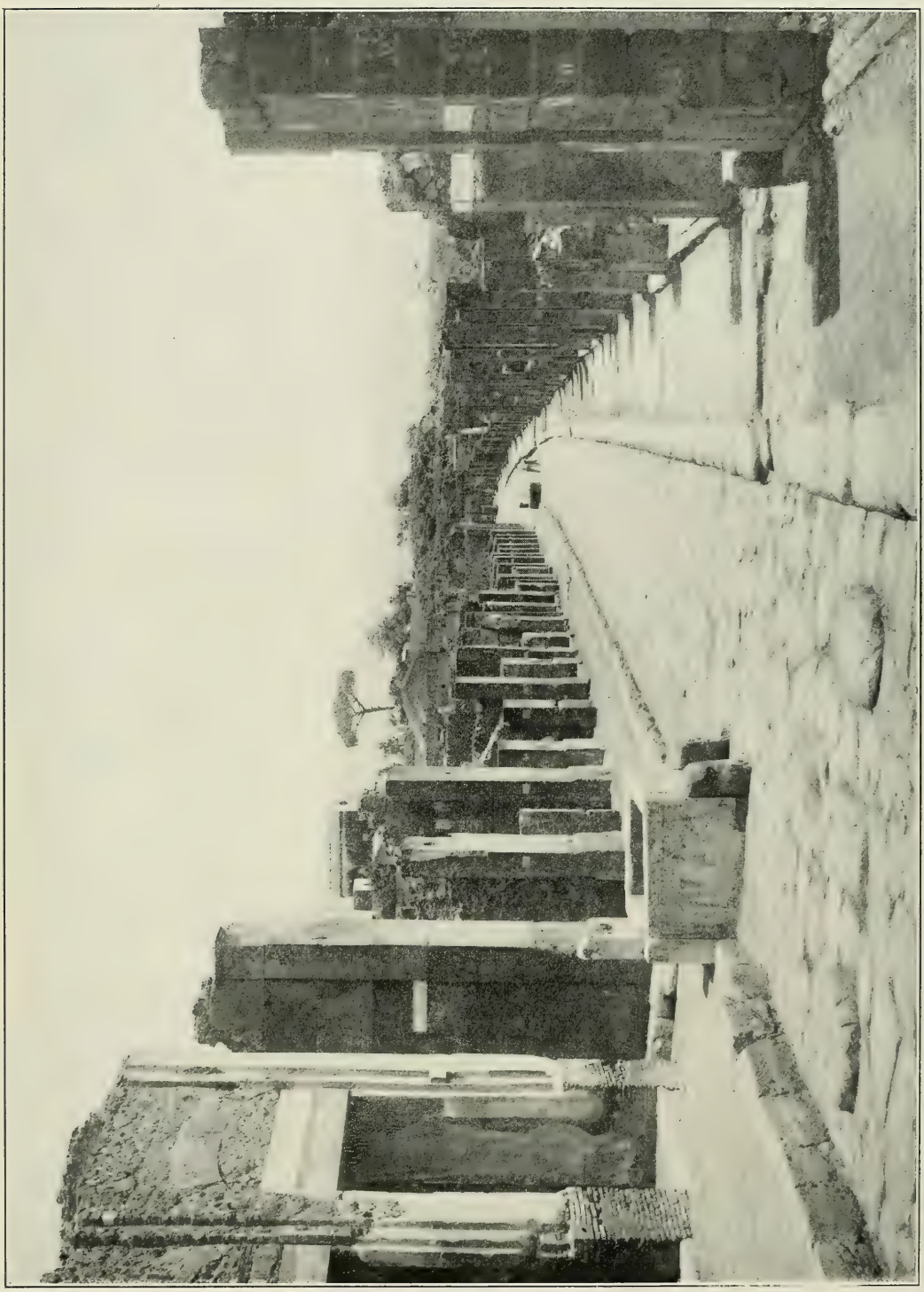


Photo from Mrs Gardiner G. Hubbard

A Street in Pompeii

Photo from Mrs Gardiner G. Hubbard

A view of Amalfi from the old Convent of the Cappuccini, which was founded in 1212, and is now a hotel. Nearly every visitor to Naples visits this town, which is noted for its historic interest and the wonderful scenery enjoyed on the approach to it by the carriage road

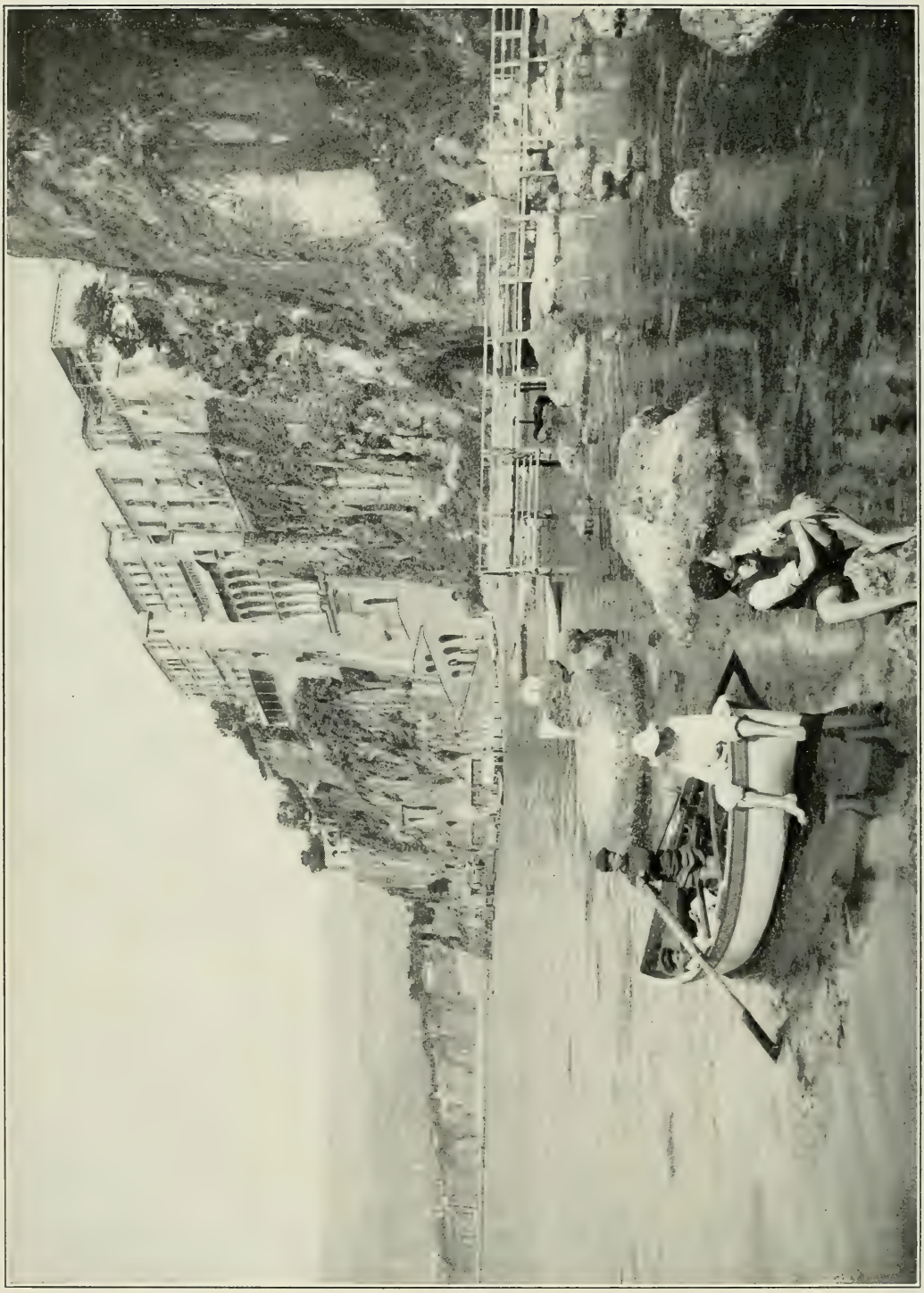
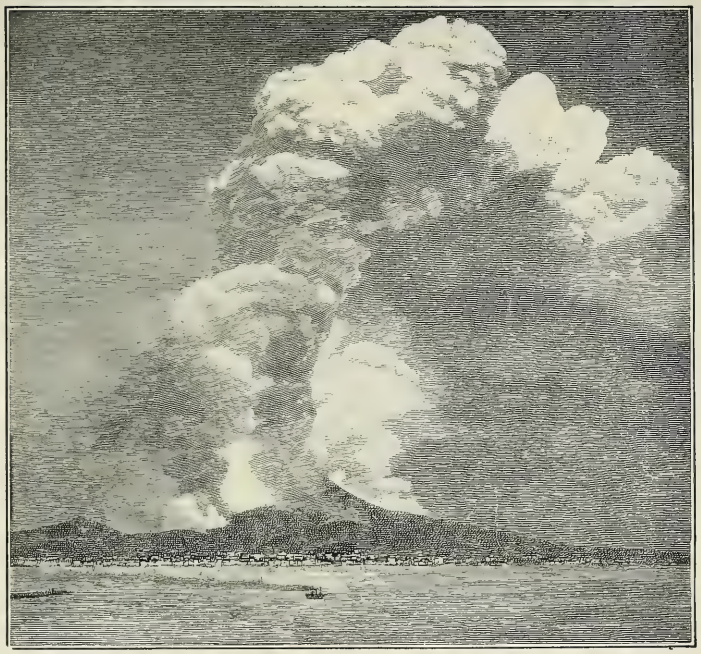


Photo from Mrs Gardiner G. Hubbard

Sorrento, which Overlooks the Bay of Naples

familiarly called the "Lighthouse of the Mediterranean."

Still southward, close by the eastern shore of Sicily, rises another volcano, also famed in classic myth, and in comparison to which Vesuvius is but a mound. Etna is more than 10,000 feet in height and has a circumference of 40 miles. Like Vesuvius, this vast cone is built chiefly of lavas and ashes coming to rest about a central pipe or throat leading up from the depths, but there have also been many small eruptions on the flanks. From time to time cracks open on the sides of the great cone, allowing the escape of lava and cinders and causing small cones to be built. Like other great mountains, it has a rugged surface, and rises through several zones of climate, being almost tropical at base, temperate and forested on its middle slopes, and arctic and snowy on its summit.



From "Physical Geography," by William M. Davis and W. H. Snyder
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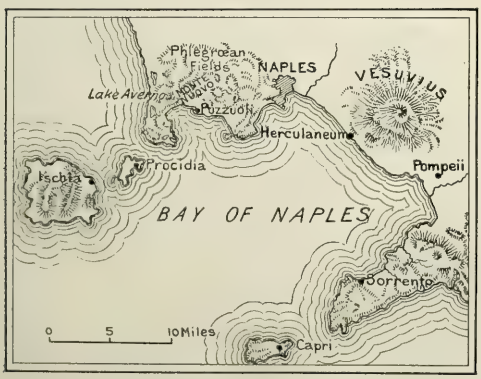
Vesuvius in Eruption

In 1831 the sea south of Sicily gave a fine illustration of the volcanic habit of that great region. At a point where the water was 600 feet deep volcanic materials were cast up until they stood 200 feet above the water. This new island, however, was soon cut away by the sea waves, leaving a shoal where the transient land had been.



Some good books describing volcanic action are:

"Introduction to Physical Geography," by G. K. Gilbert and A. P. Brigham (Appletons).

"Physical Geography," by Wm. M. Davis (Ginn & Co.).

"Volcanoes of North America," by Israel C. Russell (Putnams).

"Volcanoes; their Structure and Significance," by T. G. Bonney (Putnams).

"Text Book of Geology," by Sir Archibald Geikie (Appletons).

"Geology," by T. C. Chamberlin and R. D. Salisbury (Henry Holt), 3 vols.

THE PROBABLE CAUSE OF THE SAN FRANCISCO EARTHQUAKE*

By Frederick Leslie Ransome

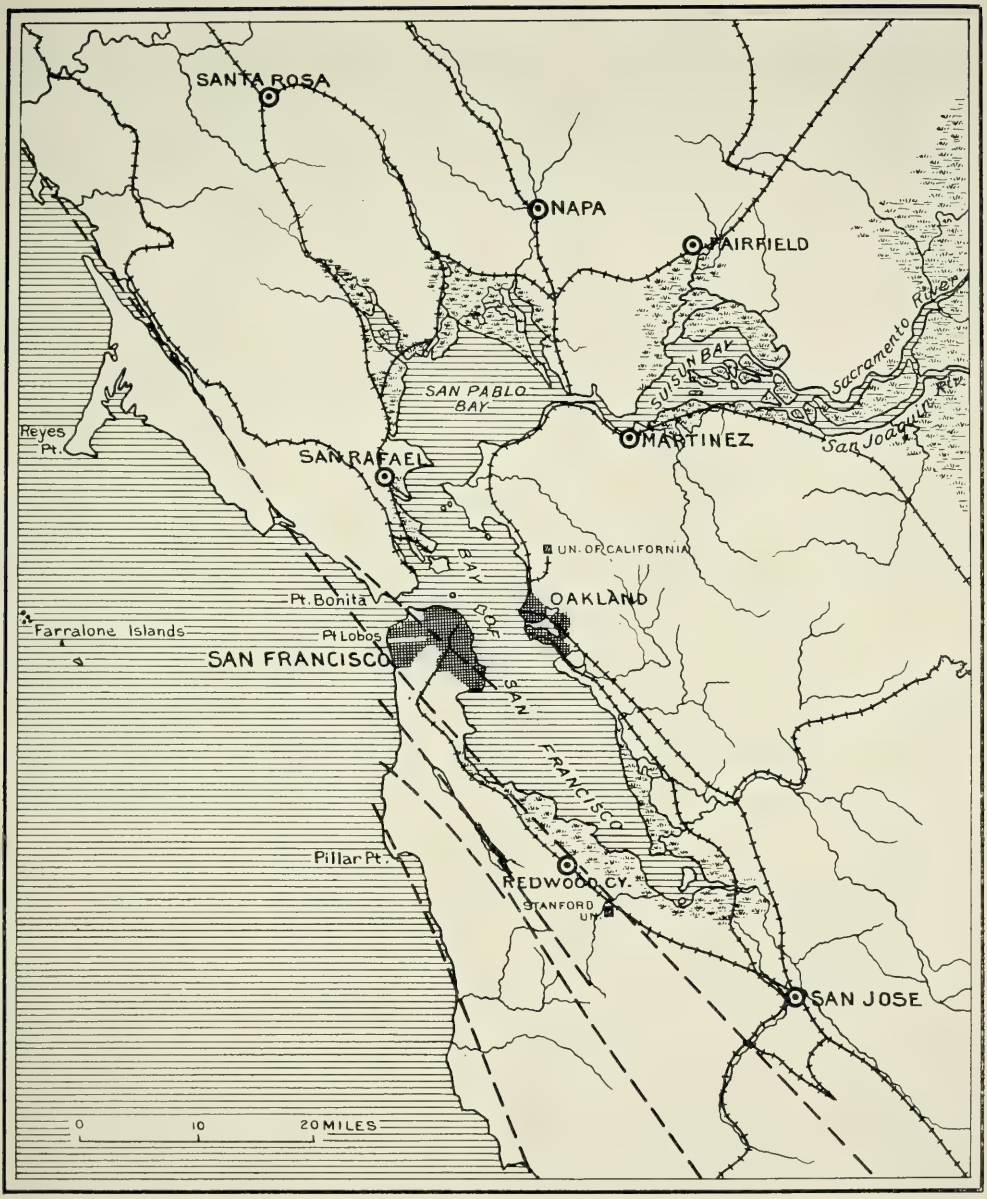
Geologist, U. S. Geological Survey

AS these words are written, three days only have passed since San Francisco was shaken by the most destructive earthquake in her history, and the subsequent unparalleled ruin wrought by fire is not yet ended. In such a stunning disaster, when communication with the outside world is interrupted, when to the heart-shaking terrors of heaving ground and toppling buildings is added a form of devastation even more appalling, and when the human aspect of the tragedy so overwhelms all other considerations, it is impossible to obtain at once and at a distance from the scene the data necessary for a satisfactory explanation of the initial catastrophe. The few facts that can be gathered for this purpose from the moving story of destruction, heroism, and fortitude are meager indeed, and the sciolist alone would pretend to find in them adequate material for deducing the real cause of the earthquake. Nevertheless a brief account of the geological history and structure of the region adjacent to San Francisco Bay may be of interest to those who are not professional geologists or who have never had an opportunity to study for themselves this part of the coast of California. Such an account will show that the present disaster was not altogether unexpected, and that the rocky structure of the peninsula upon which the city stood—in fact, of the whole Coast Ranges—suggests the probability of serious seismic disturbances in the future. It will serve, moreover, as regards this particular catastrophe, to eliminate improbable guesses as to cause and to supply a basis of fact that will aid in the intelligent interpretation of information which will gradually become more detailed and accurate as excitement subsides and communications are restored. That the following hastily prepared sketch, involving consideration of so complex a subject as the geology of the Coast Ranges, must in many respects be unsatisfactory and imperfect is of course freely admitted and, under the circumstances, seems hardly to require apology.

CAUSES OF EARTHQUAKES

Most authorities on earthquakes distinguish two main classes—(1) volcanic quakes and (2) tectonic, or dislocation, quakes. The former originate in districts of active vulcanism and at comparatively shallow depth. According to Major C. E. Dutton, the greater number of such shocks are initiated at depths less than 2 miles. They are characterized by a fairly definite centrum, a relatively short radius of influence, and the absence of subordinate after-quakes. They are phenomena that could probably be closely imitated by the explosion of a large quantity of dynamite at the bottom of a deep mine. Tectonic quakes, on the other hand, may originate at greater depth; they usually have indefinite or elongated centra; they are characterized by a greater radius of activity, and the main shock is usually followed by after-quakes. Most of the great destructive earthquakes recorded in history belong to this class. Such, for example, was the Mino-Owari earthquake in Japan, which in 1891 killed over 7,000 people, wounded over 17,000 more, and destroyed more than 200,000 houses. This quake was plainly caused by movement along a fissure which appeared at the surface as a fault about 70 miles long,

*For a comprehensive description of earthquakes the reader is referred to that interesting book, "Earthquakes," by Major Clarence E. Dutton, published by G. P. Putnam's Sons.



Outline Map of San Francisco Bay and Vicinity. Principal known faults are indicated by heavy dash lines

with a maximum throw of 20 feet. Prof. John Milne, after an exhaustive study of the seismological records of Japan, concluded that shocks are most frequent in districts that exhibit evidence of elevation or subsidence still in progress.

Four kinds of waves are generated in most earthquake shocks: (1) normal waves, (2) transverse waves, (3) surface waves, and (4) epifocal waves. The first three depend upon the elasticity of the rocks traversed, are not visible, and,

although propagated with different velocities, are not always distinguishable. The last are the visual waves, resembling, as Major Dutton says, flat waves on water. They are characteristic of the epicentral tract of many great earthquakes and are highly destructive. They bear no clear relation to elasticity and result from the passage of the deeper waves from an elastic medium (solid rock) into a feebly elastic medium, such as soil or unconsolidated sediments. They thus account for the ruin often wrought in valleys and in low ground when structures on near-by hills escape.

EARTHQUAKES VERY FREQUENT IN CALIFORNIA

The frequency of earthquakes in California is well known, and tremors sufficient to rattle the windows of dwellings in San Francisco have in the past been so common as to excite little alarm and arouse but passing interest. The number of quakes recorded in San Francisco from 1850 to 1886 is 254, and 514 additional shocks were noted in the same period in other parts of California. They are undoubtedly more prevalent in the region surrounding the Bay of San Francisco than in the northern or southern extremities of the state. While most of the recorded quakes have effected no damage, others, such as the great shock in 1868, which injured San Francisco, the Owens Valley earthquake in 1872, the Vacaville earthquake in 1892, and the Mare Island earthquake in 1898 were notably destructive. In general, it may be said that the earthquakes in California exhibit the features characteristic of tectonic quakes, and the Owens Valley shock is generally ascribed to movement along the great fault limiting the Sierra Nevada on the east.

A section across central California, we will say from Monterey Bay to Mono Lake—shows three well-marked topographic divisions. On the northeast is the gentle western slope of the Sierra Nevada, about 70 miles broad, which rises gradually from the eastern edge of the main interior valley to the crest of the great scarp overlooking the deserts of Nevada. The range is essentially a huge fault block composed of Jurassic and older rocks and partly covered by Tertiary lavas.

The Great Valley is in the main an alluvial plain 50 to 60 miles wide, its northern part drained by the Sacramento River and its southern part by the San Juaquin. Both streams flow into the head of Suisun Bay and their waters find their way across a depression in the third topographic division, the Coast Range, through San Francisco Bay and the Golden Gate into the Pacific.

The Coast Range separates the Great Valley of California from the Pacific Ocean. It comprises numerous nearly parallel ridges separated by narrow alluvial valleys and constitutes a generally mountainous belt some 60 miles in width. Both in lithology and structure it presents a marked contrast to the Sierra Nevada, although the relations of the two ranges in the northern and southern parts of the state are not as yet fully understood.

THE COAST RANGE IS YOUNG AND IS STILL GROWING

The oldest rocks known in the Coast Range are limestones and quartzites, with some crystalline schists, and are exposed at various localities from Point Reyes, north of San Francisco, to San Luis Obispo. These rocks, which are probably Paleozoic, are cut by granite supposed to be of the same general age as the main granitic intrusions of the Sierra Nevada, which are known to be post-Jurassic. All of these rocks, after being above sea-level long enough to be extensively eroded, were submerged and were covered by a series of sediments several thousand feet thick, known, from its characteristic development at San Francisco and on the north side of the Golden Gate, as the Franciscan, or Golden Gate, series. Although the Franciscan consists mainly of sandstone such as forms the well known Telegraph Hill in San Francisco and the

A Typical Quarry Exposure of Sandstone Beds in the Franciscan Series

This is the most common rock near San Francisco. It forms most of the conspicuous hills upon which the city is built, the principal islands in the bay, and most of the north shore of the Golden Gate

Radiolarian Chert at Hunters Point

These thin-bedded jaspery rocks are very characteristic of the Franciscan series. They are made up largely of the siliceous skeletons of the minute marine organisms known as radiolaria. On account of its hardness the rock is much used for macadam. The smooth red driveways in Golden Gate Park, familiar to visitors to San Francisco, are paved with this chert.

larger islands in the bay, it contains also some of the most interesting and characteristic rocks of the western coast, such as the serpentines, the blue glaucophane schists, with their wonderful mineralogical variety, and peculiar jaspery rocks made up in part of the siliceous skeletons of radiolaria. The age of the Franciscan series, which forms a large part of the Coast Range, is still open to question. It is thought by some geologists to be Jurassic, by others to be early Cretaceous.

The deposition of the Franciscan sediments was ended by an upward movement of the sea bottom. They were folded and faulted, lifted above sea-level and eroded by streams and waves. Again, however, the land went down, the Franciscan rocks sank beneath the sea and were covered by thousands of feet of fossiliferous Cretaceous, Eocene, and Miocene deposits. The sediments of the last period alone attained a thickness of over 8,000 feet. At the close of the Miocene and after minor oscillations of level the rocks were again raised above sea-level and were crumpled and faulted by the energy of the uplift until they formed a well-defined range separating the ocean from the interior valley.

In Pliocene time the land again subsided, although the Coast Range was probably not wholly submerged, and marine deposits of this period were laid down in sounds or inlets.

Here belongs the San Pablo formation, a thick accumulation of sandstones with intercalated volcanic tuffs. Apparently during the later stages of San Pablo deposition new movements of the land took place whereby fresh-water basins were formed, in which accumulated over 3,000 feet of sediments and lava flows—the Berkleyan and Campan series of Professor Lawson. Nor is this all. Still later in the Pliocene was deposited the Merced series, which is exposed along the ocean beach west of San Francisco. This remarkable deposit, described and named by Professor Lawson, is a mile in thickness and has at its base the well-preserved remnants of a coniferous forest. Thus a portion of the Tertiary land upon which pines, indistinguishable from the species were growing now common at Monterey, sank beneath waves to a depth of at least 5,000 feet, and so rapidly that the trees were buried under sediments before they could decay. Finally the Merced series, carrying in its upper beds fossils of *Quaternary* age—the mere yesterday of geological time—have been elevated above sea, tilted up at angles as high as 75 degrees, and dislocated by a fault of at least 7,000 feet throw.

THE COAST RANGE COMPARED TO THE ATLANTIC SEABOARD

In order that the full significance of this epitome of the marvelous history of the Coast Range may be appreciated, let us turn for a moment to the Atlantic seaboard. Here the entire series of post-Jurassic rocks constitutes a comparatively thin veneer upon a coastal plain that nowhere rises more than a few hundred feet above the sea. The sediments are in large part unconsolidated, are practically horizontal, and are exposed only in the low banks of streams that flow sluggishly across the plain from the crystalline piedmont belt to the sea. On the Pacific coast, on the other hand, rocks of the same age have a thickness that may easily exceed 40,000 feet, have been deposited under conditions involving repeated vertical oscillations of the land measurable in thousands of feet, and have been folded and faulted into mountain ridges now standing thousands of feet above the ocean. Most significant of all is the fact, already brought out but presently to be further emphasized, that this extraordinary geological activity has continued up to the very dawn of the human era and is probably still in operation.

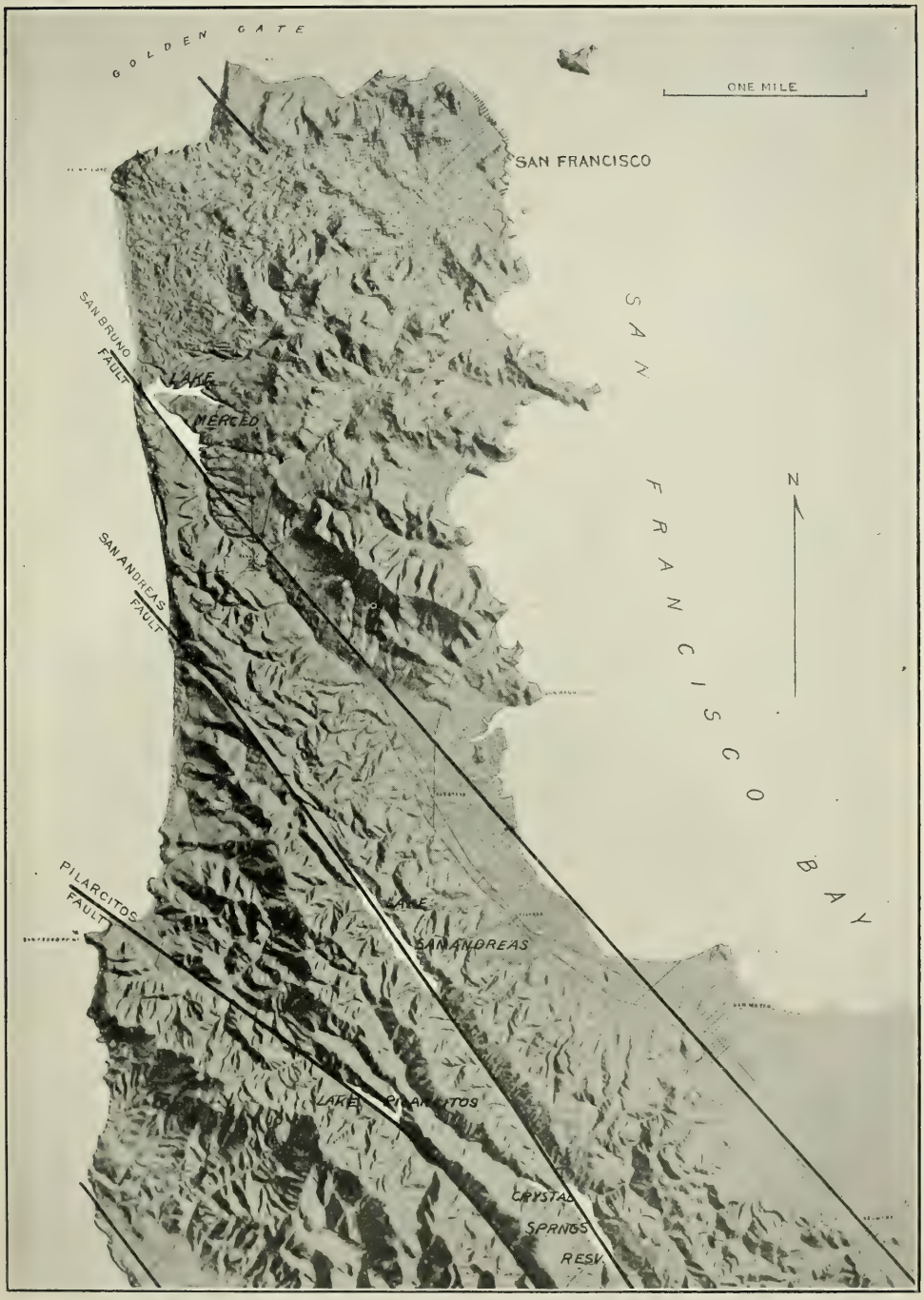
"FAULTING"

If any one will look at a good map of California he can scarcely fail to notice the striking parallelism of structure shown by that part of the state lying north of

Tulare Lake and south of Red Bluff, near the head of the Sacramento Valley. This parallelism is not confined to the two main ranges, the Great Valley and the coast line, but is conspicuously shown by the ridges and valleys of the Coast Range. In the absence of local geological knowledge, this feature of the topography might be ascribed to regular folding, such as that of the Appalachians. The actual complexity of the folding, however, and the fact that the structural details of the ridges show little accord with the general topographic regularity referred to, dispose effectually of this suggestion. There can be little doubt that the principal longitudinal ridges and valleys of the Coast Range are due to faulting modified by erosion. Much detailed work remains to be done before the positions and throws of all these faults can be determined, but such careful structural studies as have been made of definite areas have invariably revealed the great importance of dislocations having a generally north-northwest trend. This is particularly true of the San Francisco peninsula, which, as Prof. Lawson has shown, is traversed by at least three great faults belonging to this dominant system. These have been plotted on the accompanying outline map of the region about San Francisco Bay and relief map of the peninsula. The San Bruno fault has a throw of at least 7,000 feet near San Francisco, the southwest side having dropped relative to the northeast side. In all probability this same fault determines the positions of Bolinas and Tomales bays, north of the Golden Gate, and the straightness of the coast line as far as Point Arena, 100 miles northwest of San Francisco. Toward the south the same fault, or one belonging to the same zone, is said to be traceable almost to the Gulf of California, and in parts of southern California is locally known as "the earthquake crack." The San Andreas fault, which, as may be seen from the San Mateo topographic atlas sheet of the U. S. Geological Survey as well as from the small relief map on page 287, is followed by a rectilinear ravine occupied by a chain of ponds and lakelets whose existence is proof of recent disturbance. The third, or Pilarcitos, fault has not impressed its presence upon the topography of the peninsula in as conspicuous a manner as the other two. It is highly probable that future careful work will discover other great faults generally parallel with those mentioned. There is a strong suggestion, for example, of a fault passing near San José, along the eastern margin of the bay, through Santa Rosa, and northwestward along the valley of the Russian River past Ukiah.

THE COAST IS STILL RISING

There is still another series of movements undergone by this remarkable coast in late geological time, and these, like the faulting, are still in progress. Professor Lawson has clearly demonstrated that the coast of California has been elevated since the Pliocene to heights ranging from 1,500 feet near San Diego to over 2,000 feet in northern California. This uplift is shown with great clearness along the coast in the vicinity of Los Angeles by conspicuous wave-cut terraces, rising tier after tier above the present strand and showing all the characteristics of marine shores, even to pits made by the same species of rock-boring mollusc that inhabits the present beaches. These movements have not been uniform along the entire coast. For instance, the mainland at San Pedro south of Los Angeles has risen 1,240 feet, and San Clemente Island, 50 miles farther south, has risen 1,500 feet. Half way between these two localities is Santa Catalina Island, which not only shows no evidence of recent elevation but is clearly undergoing submergence. One of the latest phases of this vertical oscillation of the shoreline has been the submergence of the coast in the vicinity of San Francisco, whereby the depression now occupied by San Francisco Bay was transformed from a valley to one of the finest harbors in the world, and the Golden Gate, once a river gorge, was prepared for the part



Map of the San Francisco Peninsula

From the model by Prof. A. C. Lawson, of the University of California. The principal faults are indicated by heavy black lines

Photo by Bailey Willis

Coast of California about 55 Miles Southeast of Monterey

This part of the coast is a great fault scarp

Photo by Bailey Willis

Curious Pillow Structure in Basalt forming part of the Franciscan Series at Point Bonita, on the north side of the Golden Gate

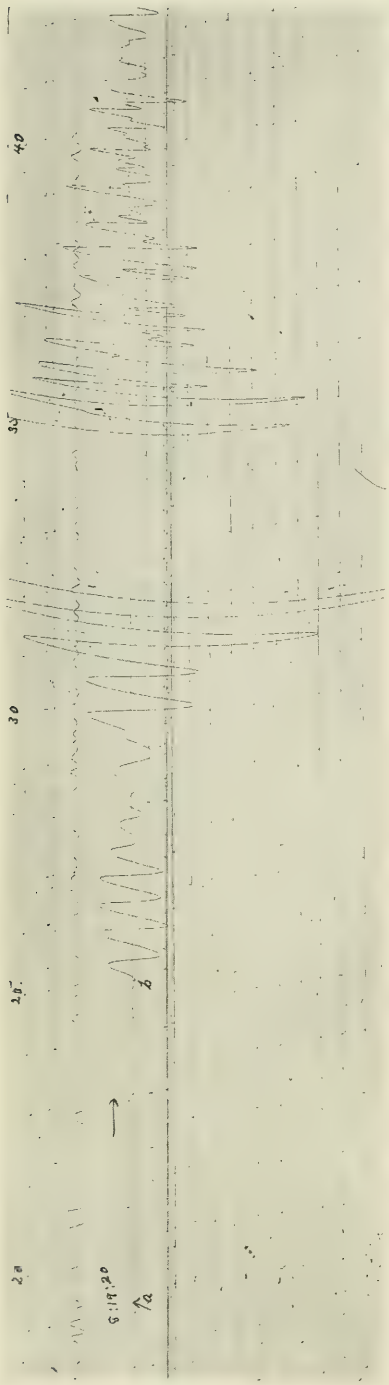
Photo by Bailey Willis

An Outcrop of Miocene Strata on the Coast of California near San Simeon

Photo by Bailey Willis

White Oaks on Piajo Creek, a branch of Naciemento Creek

Typical primeval vegetation of the fertile valleys of the Coast Range southeast of Monterey



Record of San Francisco Earthquake as made by the Seismograph at the U. S. Weather Bureau, Washington, D. C.

East and west component. Numbers at top are minutes of time corresponding to the dots on the record. (See page 296)

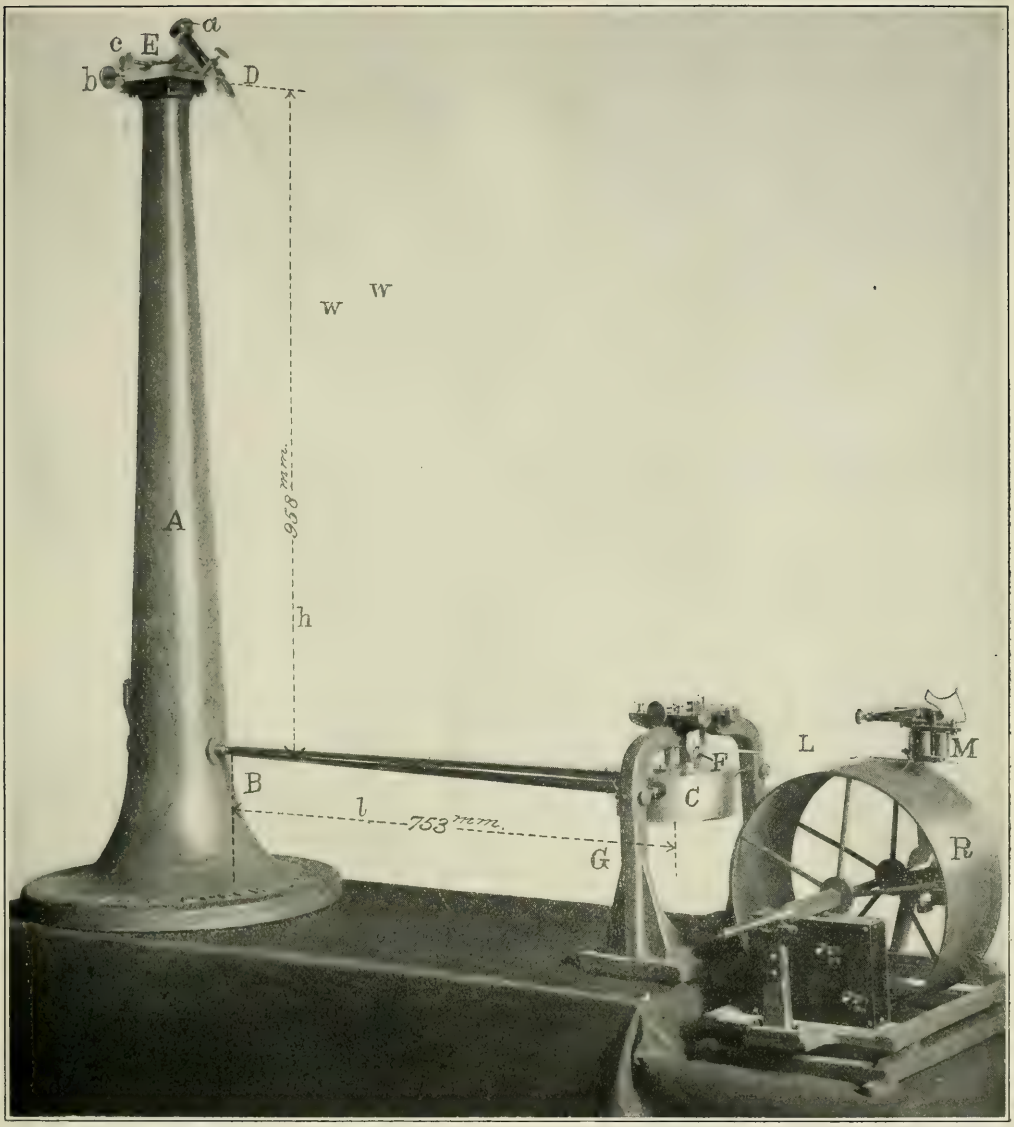
it was destined to play in the commercial development of the Pacific and the Orient.

PROBABLY IN NO PART OF THE WORLD HAS THE LAND BEEN SO ACTIVE IN RECENT TIMES

The general connection between the geological history that has just been briefly summarized and the earthquakes so prevalent in California is clear and unmistakable. We have seen that the record of the rocks shows that through long geological periods the land has oscillated up and down in a startling manner. Probably in no part of the world have the processes of upheaval and subsidence, folding and faulting, and erosion and sedimentation been, as a whole, so intensely active in the same period of later geological time. Moreover, the general activity and rapidity of geomorphic development have continued up to the present day. The region thus amply fulfills the conditions under which tectonic earthquakes arise. It is in unstable equilibrium, and it is cut by long north-northwest faults into narrow blocks which are in turn traversed by many minor dislocations. Under the operation of the unknown forces of elevation and subsidence, stresses are set up which finally overcome the adhesion of the opposing walls of one or more of the fault fissures, an abrupt slip of a few inches or a few feet takes place, and an earthquake results. The region extending for some hundreds of miles north and south of the Bay of San Francisco may be considered as particularly susceptible to shocks on account of the number and magnitude of the faults, the evidence that these furnish of very recent slipping, and the marked recent subsidence in the vicinity of the Golden Gate. We may now turn from the geological record to the recent disaster.

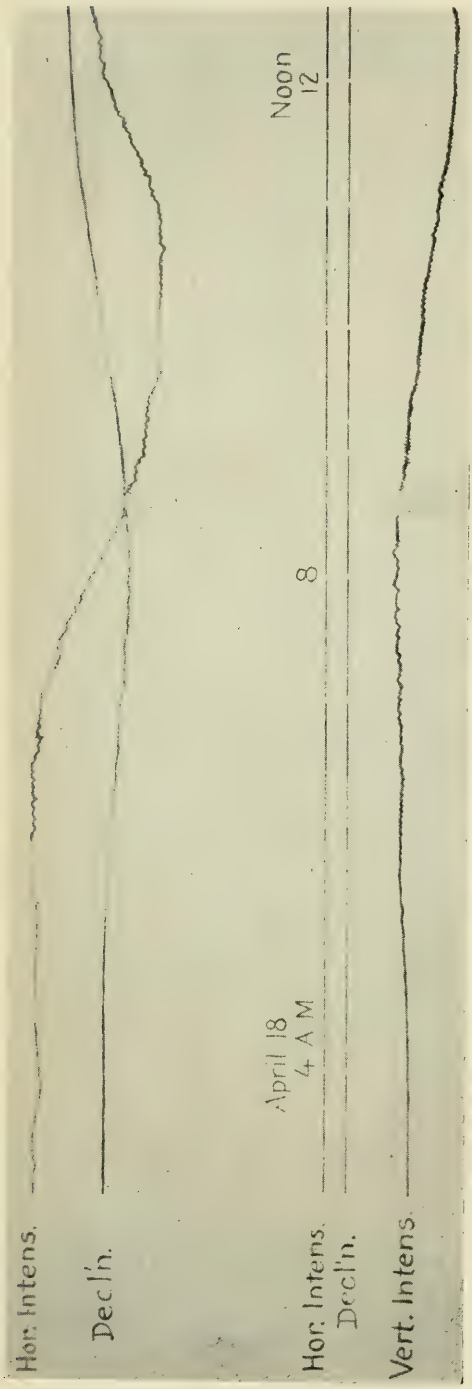
SUMMARY OF DAMAGE

The apparent facts with reference to the San Francisco earthquake of April 18, 1906, as gleaned from the daily papers, are as follows:



The Seismograph of the U. S. Weather Bureau

At 5:13 a. m., Pacific time, the city was violently shaken for 28 seconds. The force of the shock, as in 1868, was greatest in that part of the city built on made or alluvial ground (and probably heaved by epifocal waves) and was sufficient to completely wreck many large buildings and to seriously damage most of the structures in the business section. Water mains and sewers were broken, car tracks were twisted, and at Eighteenth and Valencia streets, not far from the old Spanish mission, a crevice 6 feet wide is reported to have opened in the ground. At several points in the lower portions of the city the ground is said to have set-



The San Francisco Earthquake of April 18, 1906, as recorded on the Magnetograph at the U. S. Coast and Geodetic Survey Magnetic Observatory at Cheltenham, Maryland. (See page 298)

tled several feet. A second strong but shorter shock was felt about three hours later, but as a vast conflagration was already sweeping the city the damage done by this after-quake was apparently not recorded. The city hall, situated a mile and a half from the east water front, was ruined, although it seems to have been the last building in this direction to receive serious injury.

Outside of San Francisco the principal damage is reported from a strip of country extending from the town of Ukiah, on the Russian River, 125 miles north of San Francisco, to the town of Salinas, near Monterey Bay, 80 miles south of the ruined metropolis. North and south of these limits, however, the country is for some distance sparsely settled and may have been vigorously shaken without the fact being reported. The belt of maximum disturbance is approximately parallel with the great faults of the region and includes the Bay of San Francisco and the rich Russian River, Sonoma, Santa Clara, Salinas, and San Benito valleys. Santa Rosa, the principal town of Sonoma County, was practically destroyed, and the smaller towns of Healdsburg, Cloverdale, and Ukiah to the north were badly damaged. Oakland, on the east side of the bay opposite San Francisco, apparently suffered some destruction in its business section, but, being mainly a city of frame dwellings, it escaped general demolition. The shock on this shore of the bay, however, was apparently heavy. The ground is said to have opened in some places, although the long moles of the Southern Pacific Company, built out into the bay by filling, seem strangely enough to have been uninjured. Many important buildings in Berkeley were destroyed, but the buildings of the University of California, standing on high ground, escaped. On the north shore of Suisun Bay part of the track of the Southern Pacific, laid on marsh, subsided several feet. A similar subsidence is reported from Alviso, a town at the south end of San Francisco Bay. The Santa Clara Valley suffered

severely, the principal buildings at Stanford University being destroyed or badly injured and San José being partly ruined. It is noteworthy, as indicating the narrowness of the general zone of destruction, that the Lick Observatory, situated on Mount Hamilton, about 15 miles east of San José, was uninjured. The district drained by the Pajaro River, between the town of Hollister and Monterey Bay, was much disturbed. The railroad for distances up to a mile was depressed from 4 to 6 feet. Between Castroville and Monterey the ground is said to have opened and shut and mud to have spurted from the fissures.

In the immediate vicinity of the coast comparatively little damage is reported, although the lighthouse at Point Arena, which, as already noted, is on the line of the San Bruno fault, was destroyed.

THE EARTHQUAKE ZONE

The general zone of destruction corresponds very closely to that of most of the earthquakes of central California. With the exception of the Vacaville earthquake in 1892, which was most severely felt in a belt stretching from San Francisco northeasterly through the opening in the Coast Range near Martinez and across the Great Valley to the lower slopes of the Sierra Nevada, most of the severe shocks have manifested themselves along the zone stretching from Ukiah to Hollister and Salinas. In other words, their major effects are confined to a zone at least 200 miles in length and approximately 30 miles in width. The distribution of intensities along this zone, as illustrated by the destructive effects at San José and at Santa Rosa, points decidedly to the initiation of the disturbance from a line or plane rather than from a point or definite centrum. Furthermore, the general parallelism of this line or plane with the great faults of the region can, in the light of geological history, scarcely be considered a mere coincidence. In short, the conclusion that the recent San Francisco earthquake, like those which have previously shaken the city, was of tectonic origin and that it was due to movement along one or more of the great faults may be regarded as reasonably certain. Whether this movement was along the San Bruno fault or along some other dislocation yet to be traced by patient geological work, cannot be determined from the crude and meager data now available. The reported destruction of the Point Arena lighthouse suggests that the San Bruno fault may have participated in the disturbance. If so, careful observation and comparisons of levels in the vicinity of San Francisco Bay may discover the extent of the movement.

EXPLANATION OF ABSENCE OF TIDAL WAVES

It is very probable that faults parallel with those known on land traverse the sea bottom along the coast. If any considerable throw has taken place along such a submerged fault, we may expect to receive indication of the event in a disturbance of the tidal records. Although in 1856, after a severe shock, lasting 8 seconds, the waters of San Francicso Bay are said to have risen, to have maintained their level for 5 minutes, and then to have fallen 2 feet below their ordinary stage, noticeable "tidal waves" do not appear to be characteristic of the earthquakes in California, and this fact indicates either that the shocks originate in the land area or else that they are caused by displacements of slight throw.

That San Francisco will rise beautiful and triumphant from ruin no one who knows California can doubt. Earthquakes are a risk that will be accepted by the people in the future with as little hesitation as in the past. They had grown a little careless and were taken unawares by the fatal combination of circumstances that made fire a more ruthless enemy than earthquake. Shocks will visit the new city, but they will shake buildings better able to resist them and less combustible. Professor Holden, writing in 1896, remarked that "the earthquakes of a whole century in California have been

less destructive than the tornadoes or the floods of a single year in less favored regions." While this statement may no longer be strictly true, it represents a feeling so general among Californians that no single disaster can eradicate it. Although there is every geological reason for expecting earthquake shocks in the future, there is no reason why, with properly constructed buildings and with adequate arrangements for extinguishing fires with supplies of salt water not dependent upon the ordinary mains, property and life should not be as safe in San Francisco as in any other city in the country.

THE RECORD OF THE GREAT EARTHQUAKE WRITTEN IN WASHINGTON BY THE SEISMOGRAPH OF THE U. S. WEATHER BUREAU

By C. F. Marvin

Professor of Meteorology, U. S. Weather Bureau

THE vast calamity wrought by the recent great earthquake at San Francisco amounts, it seems, to little less than the complete destruction of a great city. In a moment, almost, nearly its whole population of over 300,000 people are rendered homeless and helpless, and the sympathy and concern of the whole world is aroused in their welfare. These great human interests command the primary attention of all, but many readers will doubtless be interested to follow the simple and short account here given of some things concerning earthquakes and their measurement that modern science has accomplished.

Nowadays, by the aid of seismographs of almost inconceivable delicacy, a great earthquake occurring at one point on the globe is very certain to be recorded at practically every other point at which there is a suitable instrument. In the present case the vast expenditure of energy at San Francisco and its immediate vicinity literally set the entire mass of the earth into appreciable vibrations that subsided only after the lapse of several hours. Reports showing this to have been the case have already been announced from many places, such as Alaska, England, Italy, Austria, and islands of the Pacific. Records must certainly have been obtained throughout Europe, Asia, and Japan. Swifter than the telegraph could flash its messages of disaster throughout civilized Christendom, the trembling crust of the earth propagated its vibrations in every direction at great velocities and set the delicate registers of seismographs at work to write automatically their mute story of what was going on.

All the principal features of one of these records written at the Weather Bureau in Washington, D. C., is shown on page 292. The original record is inscribed mechanically by a sharp needle point, which traces a line upon a smooth surface of paper coated with a thin layer of soot. The numerous straight lines across the lower portion of the present record are the traces made during successive hours preceding the earthquake and show no motion of the ground. It is generally considered that a great earthquake like this at San Francisco is caused by a sudden break or fault in the strata forming the crust of the earth. Exceedingly complex vibrations, both great and small, immediately begin to radiate in every direction from the origin. The very first evidence of tremors that reached Washing-

ton appear at *a* on the record. These are the so-called preliminary tremors, which, either because they traveled faster or along a shorter path—perhaps for both reasons—reached Washington not less than six minutes earlier than the stronger motion, the record of which begins at *b*. About seven minutes later the needle was deflected off the record sheet by still more violent motion, but returned again at 8:35, and thereafter recorded vibrations of continually diminishing force for about four hours.

SPEED OF PROPAGATION

In the study of earth vibrations several distinct classes of waves are recognized, such as longitudinal, transverse, surface waves, distortional waves, etc. These appear to travel along different paths and at different velocities, and a full statement of the question of the speed of propagation is very complex. In a general way, however, it may be said that the so-called preliminary tremors travel by the shortest path between points—that is, *through* the earth along the chord rather than along the surface of the sphere. In the present case the great circle distance from San Francisco to Washington is about 2,435 miles, whereas the distance through the crust is about 40 miles shorter, and the straight-line path cuts below the surface of the earth about 186 miles at its deepest point. At still greater distances from San Francisco than Washington it is plain that the straight-line path cuts still deeper and deeper below the surface, and is also proportionately shorter and shorter than distances on the surface. Furthermore, because of its greater density and the enormous superincumbent pressure, the elastic properties of the deep-lying substance of the earth seems to propagate vibrations with higher and higher velocities the deeper the path. These considerations lead to the conclusion that if earthquake vibrations follow the path of the chord the speed of propagation should not be constant for all distances from the origin, but should be greater the greater the distance from the origin. This has generally been found to be true in the case of the preliminary tremors, and will doubtless be shown in this earthquake when accurate reports from numerous stations are examined. From San Francisco to Washington the speed along the chord is found to be 5.4 miles (8.7 kilometers) per second. This is based on Professor Davidson's time at San Francisco, viz, 5:12 a. m. This result is perhaps a trifle faster than we might expect.

The strong waves do not seem to follow the path of the chord, but rather travel along the surface at a slower rate, which is nearly constant for all distances. In the present case the velocity is 3.1 miles per second for the first strong waves, or as low as 2.2 miles per second for the maximum waves. Both of these speeds, however, are a little high, perhaps.

AMPLITUDE AND PERIOD OF THE WAVES

The recording needle of the seismograph traces a ten-fold magnification of the movement of the earth. On this basis the actual maximum displacement of the ground at Washington was nearly one-half inch each side of its position of rest. This may seem an astonishingly large movement, especially in view of the fact that no one felt any motion whatsoever. The explanation, however, is found in the fact that the motion is very slow and without shock, so that buildings and objects are moved to and fro without the slightest strain or injury.

THE SEISMOGRAPH

The record at Washington was made by the aid of the instrument shown on page 293. The massive lead weight *C* is suspended by the wires *W* and the horizontal strut so as to swing very freely about a nearly vertical axis from *D* to *B*. During an earthquake this heavy mass remains almost completely at rest with respect to lateral motions, and thus provides a steady point in reference to which the motion of the ground can be measured and registered. For this purpose a

long needle or lever, *L*, is pivoted very delicately to the heavy yoke piece *G*, secured to the ground. The short end of the lever rests very gently against a projection from the steady mass *C*. The long end is tipped with a light stylus, which writes the record on the smoked surface of the drum *R*. The magnet *M* serves, by the aid of a clock, to mark minutes of time on the record sheet.

THE SAN FRANCISCO EARTHQUAKE OF APRIL 18, 1906, AS RECORDED BY THE COAST AND GEODETIC SURVEY MAGNETIC OBSERVATORIES*

By L. A. Bauer and J. E. Burbank

THE recent severe earthquake, which caused such serious damage in San Francisco and vicinity, was recorded on the seismograph at the principal magnetic observatory of the United States Coast and Geodetic Survey at Cheltenham, Maryland, 16 miles southeast of Washington, as the largest earthquake recorded since the instrument was mounted, in December, 1904. This observatory is 2,450 miles in an air line from San Francisco.

The seismograph is of the Bosch-Omori type, especially adapted to detect and record any vibration of the ground. It consists of two parts, one adjustable to record the north-south component of the earth's motion and the other adjusted to record the east-west component.

At Cheltenham (see table) the preliminary tremors began at 8h. 19m. 24s. at a distance of 2,450 miles from San Francisco. Assuming now the time of the first shock as 5h. 12m. 38s. Pacific time, or 8h. 12m. 38s. Eastern time, as given by Prof. A. O. Leuschner, of the University of California, the velocity of these tremors, along the chord† connecting San Francisco and Cheltenham, is found to be 5.9 miles, or 9.6 kilometers, per second, about 30 times the velocity of sound. The time taken for these waves to cross the continent was 6 minutes 46 seconds. The large waves began about 8h. 30m. 13s., or at an interval of 17m. 35s. after the first shock was felt at San Francisco; hence the velocity of these waves appears to be about 2.32 miles per second.

As will be seen from the accompanying table (I), the duration at Cheltenham of the earthquake was about 4 hours. The duration of the strongest motion, however, was only from 8h. 30m. to about 8h. 40m.; during this period the amplitude of the motion was too large to be wholly recorded by the seismograph.

The period of vibration in the preliminary tremors was about two to four seconds; in the principal portion it varied from ten to twenty seconds.

†It is a mooted question as to the precise path followed by the preliminary tremors; it is believed, however, that the distance traversed will correspond much more nearly to that of the chord than to that along the surface. According to the distinguished seismologist, Prof. E. Wiechert, director of the Geophysical Institute at Göttingen, Germany, who is making at present a brief visit in the United States and to whom was shown the records obtained by the Coast and Geodetic Survey, the large disturbances, traveling much less rapidly than the preliminary tremors, proceed most likely along the surface or at least at no very great depth below it.

* Communicated by Mr O. H. Tittmann, Superintendent of the U. S. Coast and Geodetic Survey.

The corresponding data as communicated in a cable dispatch from the Sitka magnetic observatory will be found in the tables below.

The air-line distance of Sitka from San Francisco is 1,455 miles, whereas the distance along the chord is about 1,447 miles. Accepting the time of the first shock felt at San Francisco as given above by Professor Leuschner, it took 4 minutes 18 seconds for the preliminary tremors to reach Sitka, against 6 minutes 46 seconds to reach Cheltenham. The velocity along the chord connecting Sitka and San Francisco is 5.6 miles, or 9.0 kilometers; hence about the same as that deduced for the corresponding waves at Cheltenham.

The present indications are that the source of the earthquake disturbance was not far from San Francisco, though more definite information on this point will be had as soon as the records from the Honolulu observatory have been received.

According to Professor Leuschner, quoted above, who had in operation during the earthquake a Ewing seismograph, the principal direction of motion was S.SE. to N.NW. He says that "the remarkable feature of this earthquake, aside from its intensity, was its rotary motion." Comparing the three severest earthquakes on record at San Francisco, viz, those of October 21, 1868, March 30, 1898, and the present one, he finds that they have several features in common, namely, that the heaviest shocks are generally in the direction S.SE. to N.NW.; and, again, while the displacements are very large, the vibration period is comparatively slow, amounting to about one second in the last two big earthquakes. He says "the slowness of the vibration is the only redeeming feature of these calamities."

This earthquake, besides being recorded the world over on seismographs, likewise affected the self-recording magnetographs at the three magnetic observatories of the Coast and Geodetic Survey thus far heard from.

At the magnetic observatory, Cheltenham, Maryland, the disturbance began about 8:30 a. m., Eastern time, on April 18, and continued for about half an hour. It will be noticed in the table giving the time as recorded by the seismograph that while this disturbance began some time later than the preliminary tremors, it coincides with the principal portion of the disturbance as recorded on the seismograph. It affected principally the horizontal and vertical components of the earth's magnetic intensity; the greatest disturbance amounts to one-one-thousandth part of the horizontal intensity and about one-two-thousandth part of the vertical intensity. It was not of the same character as that due to a cosmic magnetic storm or as that recorded in connection with the Mont Pelé eruption, but appears to be chiefly, if not entirely, mechanical.

[At the present moment it cannot be definitely stated whether there was a general magnetic disturbance similar to that of the Mont Pelé eruption in connection with the recent eruptions of Vesuvius. A very similar disturbance began on April 8 at 9h. 39m. a. m., Eastern time. However, this is 12 hours later than the reported time of the beginning of the Vesuvius eruption. It will be necessary to await the full reports from Professor Matteuci's Vesuvius observatory. Magnetic disturbances affecting simultaneously points over the entire earth do not necessarily accompany volcanic eruptions. For example, the mighty eruption of Krakatoa was not accompanied by a magnetic disturbance of the character associated with the Mont Pelé eruption; its effect on magnetic instruments was local.]

The illustration on page 294 shows the earthquake disturbance as recorded on the magnetograph at the Cheltenham observatory.

At Baldwin, Kansas, where there is no seismograph, the magnetic instruments also recorded a similar disturbance, lasting from 8:24 to 8:31, Eastern time, some time after the preliminary tremors of the earthquake had reached Cheltenham. At

this observatory also some preliminary effects were noted.

At the Sitka observatory this disturbance was also recorded by the magnetic instruments from 8:24 to 8:30, Eastern time, somewhat later than the preliminary tremors recorded on the seismograph at the same observatory.

It is of interest to point out that the times recorded for the principal disturbances at the latter two places, Baldwin and Sitka, which happen to be nearly the same distances from San Francisco, are about the same. Furthermore, it is seen that the disturbance at Cheltenham (see Table II) begins at a proportionate interval later.

It is to be noticed that in each of the three cases the disturbance on the magnetograph occurs at about the same time that the greatest motion is being recorded on the seismograph.

The self-recording magnetic instruments, or magnetographs, on which the above-described effects were recorded, consist of very small magnets about one inch long and a third of an inch wide by one-sixtieth of an inch thick, suspended by a fine quartz fiber and carrying a tiny mirror. The record is obtained by reflecting a spot of light from the mirror to a sheet of sensitive photographic paper wound on a cylinder, the latter being revolved uniformly by means of a clockwork. By this means a continuous record of the movements of the magnets is obtained on the paper. Two of these magnets, each mounted at some distance from the other, record respectively the declination or direction and the horizontal component of the earth's magnetic intensity. A third magnet, somewhat larger, mounted on sharp points and moving in a vertical plane, records the vertical intensity of the earth's magnetic force.

The question whether the earthquake disturbs the magnets in a purely mechanical way or by its action on the earth's magnetism is by no means settled. In fact it is only recently that this phenomenon is being systematically studied. Up to the present the results are contradictory. At times the magnetic disturbance is simultaneous with or actually precedes the preliminary tremors. In other cases, like the present one, it accompanies the principal portion of the disturbance. In some cases of large earthquakes no magnetic effect can be detected, and in a few other cases, notably March 21, 1904 (New England earthquake), the shock was recorded at Cheltenham by the magnetic instruments, but was not recorded by the seismographs at Toronto, Baltimore, or Washington.

TABLE I

SAN FRANCISCO EARTHQUAKE OF APRIL 18, 1906, AS RECORDED BY THE SEISMOGRAPHS OF THE U. S. COAST AND GEODETIC SURVEY AT SITKA, ALASKA, AND CHELTENHAM, MARYLAND

(Eastern or 75th meridian time)

	Sitka, Alaska.			Cheltenham, Maryland.		
	h.	m.	s.	h.	m.	s.
Preliminary tremors began	8	16	56	8	19	24
Principal disturbance at	8	20	48	8	30	13
Maximum disturbance, about	8	23		8	35	
Disturbance ended about	10	57		12	00	

TABLE II

AS RECORDED ON THE MAGNETOGRAPHS

(Eastern or 75th meridian time)

	h.	m.		h.	m.	
Sitka Alaska	8	24	to	8	30	a. m.
Baldwin, Kansas	8	24	to	8	31	a. m.
Cheltenham, Maryland	8	30	to	9	04	a. m.

U. S. Coast and Geodetic Survey, April 20, 1906.

The Republic of Chili. By Marie Robinson Wright. Pp. 450, with many illustrations. 9½ x 12½ inches. Philadelphia: Geo. Barrie & Sons. 1904.

This book is dedicated "To the women of Chile," which republic, we are told, is as nearly a woman's paradise as any country outside of the United States can be. Little of the seclusion enforced by many Latin races is found here, and the Chilean woman holds a high place in the social and domestic economy of the country.

The wealthy Chilean lives principally at his country home. Thousands of acres of land often comprise these estates, and in many cases it becomes necessary to establish sawmills, blacksmith shops, and refrigerating plants, as well as farms, for the private use of their owner. A most attractive picture of social and domestic life on these plantations is given in a chapter, "Life on a Chilean Hacienda."

In contrast to these luxuriant estates is the arid "nitrate desert," where nothing can be grown except by artificial means, and such plants as ornament Iquique are raised in soil brought from distant parts of the country. Water is brought to the city from an oasis a hundred miles away. These fields are, however, Chile's treasure-house, as she exports over a million tons of nitrate annually to Europe and the United States. F. M. A.

The Congo: a Report of the Commission of Inquiry. Pp. 171. New York and London: G. P. Putnam's Sons. 1906.

The above is a translation made by Prof. James H. Gore. In consequence of numerous reports of abuses practiced upon the natives of Congo Free State by officers of the government and by other persons, in 1904 the King of Belgium appointed a committee of three persons to investigate the conditions in that state, especially with reference to these charges, and to suggest suitable remedies for abuses, if any were found to exist. This committee commenced its investigation October 5, 1904, and closed it February 21, 1905, thus devoting four and one-half months to work on the ground. The investigation appears to have been thorough and impartial.

The commission found that many, if not most, of the charges were substantiated, but that a large proportion of the cases were unavoidable. If it was desirable, for the protection of the natives against the slave traffic and from internecene wars, not to mention their education and advancement in civilization, that a white man's government should be instituted over them, and presumably it was desirable, the natives must submit to taxation for its support. The tax takes the form of contributions of natural products or of labor. Now the average native, not appreciating the benefits of good government, endeavors to evade the payment of the tax, owing to his indolent disposition, and measures have to be taken to collect the tax, by force if necessary. Hence whipping and imprisonment have been resorted to, and in many instances conflicts have occurred in which the black soldiery have massacred the inhabitants of villages. Moreover, besides the labor received in working out taxes, much native labor must be had for railroad and station building and for a thousand other purposes connected with the institution and carrying on of government, which it is difficult, and in many cases impossible, to obtain without conscription.

Certain parts of the territory of the Congo Free State, moreover, have been farmed out to companies which are exploiting them, and it is in these concessions that the greatest abuses have been discovered, as might be expected.

The commission makes many recommendations for reform, and for the purpose of carrying these out the King of Belgium has appointed a committee of fourteen persons, including the three members of the committee on investigation. H. G.

Old Provence By Theodore A. Cook. 2 vols. Pp. 348, 448. 5 x 8 inches. Illustrated. New York: Scribner's. $4.00 *net.*

These two volumes from the pen of Theodore Cook will be thoroughly enjoyed by lovers of romantic and historical mysticisms, folklore, and legends of Old France, and especially will they be welcomed by many who read and appreciated the former volumes of Mr Cook, "Old Touraine," the Life and History of the Chateaux of the Loire.

In volume I Mr Cook has given much historical information of the Phœnician, Greek, and Roman rule in Old France, together with many illustrations and accurate descriptions of the architectural wonders created by them, many traces of which are yet to be found.

Coming down through the centuries, volume II contains a fund of information touching upon the religious beliefs and worship of the times, bringing out in relief the class distinction and the almost God-like reign of the feudal lords, together with the unceasing wars between the princes of the church.

Every page of this interesting history seems to furnish a romance in itself, and one readily discerns the historical field of Maurice Hewlett's romances. J. O. L.

The Philippine Experiences of an American Teacher. By William B. Freer. Pp. 344. 5 by 7¾ inches. Illustrated. New York: Charles Scribner's Sons. 1906.

In this volume we see the Filipino in his home, in his church, at some gay fiesta, and at the schools established by American teachers, who are frequently aided in their teaching by trained natives. The old method of "rapid-fire" questions used to instruct youth under the Spanish regime has been put aside for the newer system of giving instruction in English

through object and action lessons. The children take much interest in this mode of learning, and make good progress. Night schools have been established for grown people, and are well attended, for the Filipino child and adult are eager to learn.

A list of Spanish words and their English equivalents, a bibliography, and an index are found at the end of the book. F. M. A.

BOOKS ON ITALIAN SUBJECTS*

†"Italy, Rome, and Naples." Hippolyte Adolphe Taine. Henry Holt. $2.50.

†"Rambles in Naples." S. Russell Forbes. Thomas Nelson Sons. $1.25.

†"Naples:" The City of Parthenope. Clara Erskine Clement. Dana, Estes & Co. $3.00.

†"Southern Italy and Sicily, and the Rulers of the South." Francis Marion Crawford. Illustrated by one hundred original drawings by Henry Brokman. Macmillan Co. $2.50.

†"Italy and the Italians." Edward Hutton. E. P. Dutton. $1.50.

†"Cities of Southern Italy," "Cities of Central Italy," "Cities of Northern Italy." By Augustus Hare. Macmillan Co. $3.50.

†"Travels in Italy." By De Amicis.

"A Short History of Italy: An attempt to give a correct impression of Italian history as a whole." Henry Dwight Sedgwicke. Houghton, Mifflin & Co. $2.00.

†"Italian Cities." Edwin Howland Blashfield and Evangeline Wilbur Blashfield. Scribner. 2 volumes. $4.00.

†"Italian Byways." John Addington Symonds. Scribner. $4.20.

†"Two in Italy." Maud Howe. Little, Brown & Co. $2.00.

†"Roma Beata:" Letters from the Eternal City. Maud Howe. Little, Brown & Co. $2.50.

†"Ave Roma Immortalis:" Studies from the Chronicles of Rome. Francis Marion Crawford. Macmillan Co. $2.50.

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†"The Eternal City of Rome:" Its religions, monuments, literature, and art. Clara Erskine Clement. Dana, Estes & Co. 2 volumes. $6.00.

†"Venetian Life." William Dean Howells. Houghton, Mifflin & Co. 2 volumes. $5.00.

†"Salve Venetia:" Gleanings from Venetian history. Francis Marion Crawford. Macmillan Co. 2 volumes. $5.00.

*It is planned to publish each month a bibliography of good books on some current geographic subject.

†Illustrated.

UNITED STATES GEOLOGICAL SURVEY,
WASHINGTON, D. C., *April* 23, 1906.

Editor National Geographic Magazine:

In your April issue there is a letter by Mr C. M. Taintor relative to glaciers in the Wind River Range, Wyoming, for which he proposes the name Roosevelt Glaciers. Without considering the desirability of the appellation, it should be pointed out that these glaciers were discovered in 1878 by Prof. W. H. Holmes, Director of the Bureau of Ethnology, when he was conducting one of the expeditions of the U. S. Geological Survey, under the direction of F. V. Hayden. Professor Holmes prepared a panorama of the principal glacier, which is included in the atlas accompanying the report of the Hayden Survey for 1878. Later he supplied descriptive notes which were incorporated in a memoir by I. C. Russell, on "Existing Glaciers in the United States," published in the 5th Annual Report of the U. S. Geological Survey, page 344.

Yours truly, N. H. DARTON,
Geologist.

ANNUAL EXCURSION OF THE NATIONAL GEOGRAPHIC SOCIETY

The annual excursion of the members of the National Geographic Society resident in Washington and vicinity will this year be to the noted Luray Caverns, in Page County, Virginia. The excursion will leave Washington on a special vestibule train from the Baltimore and Ohio depot, Saturday morning, May 19, at eight o'clock sharp, reaching Luray about eleven. Busses will carry the party to the caverns, situated about half a mile from the station, through which they will be escorted in parties by guides. After the excursion through the cave a substantial hot luncheon will be served at the Mansion Inn. Those who prefer can get their luncheon before visiting the cave. The party will take the train again about half past three, reaching Washington about six-thirty.

Through the courtesy of Mr S. B. Hege, district passenger agent of the Baltimore and Ohio Railroad, the National Geographic Society has been granted a special rate of $2.50 for the round-trip ticket to Luray. Transportation to the cave and back, admission fee, and luncheon will cost $1.50 additional; so that the total expense for the trip will be $4.00 for each person. (The regular round trip fare to Luray is $5.75 and admission to the caverns and bus fare $1.25, but the daily train schedule is such that a trip to the caverns cannot ordinarily be made with comfort for less than $10.00.) As the committee has been obliged to give a guarantee of 175 persons in order to secure these special rates, the request is made that every member who intends to take part in the excursion will send in his name immediately and the names of the friends accompanying him. The Luray Caverns are among the most wonderful natural phenomena in the world. They are not as large as the Mammoth Cave, but in brilliancy and beauty they are reputed to surpass it.

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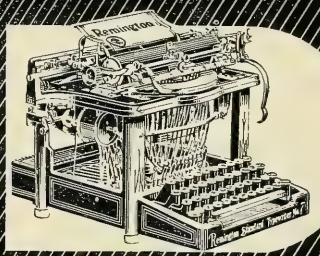

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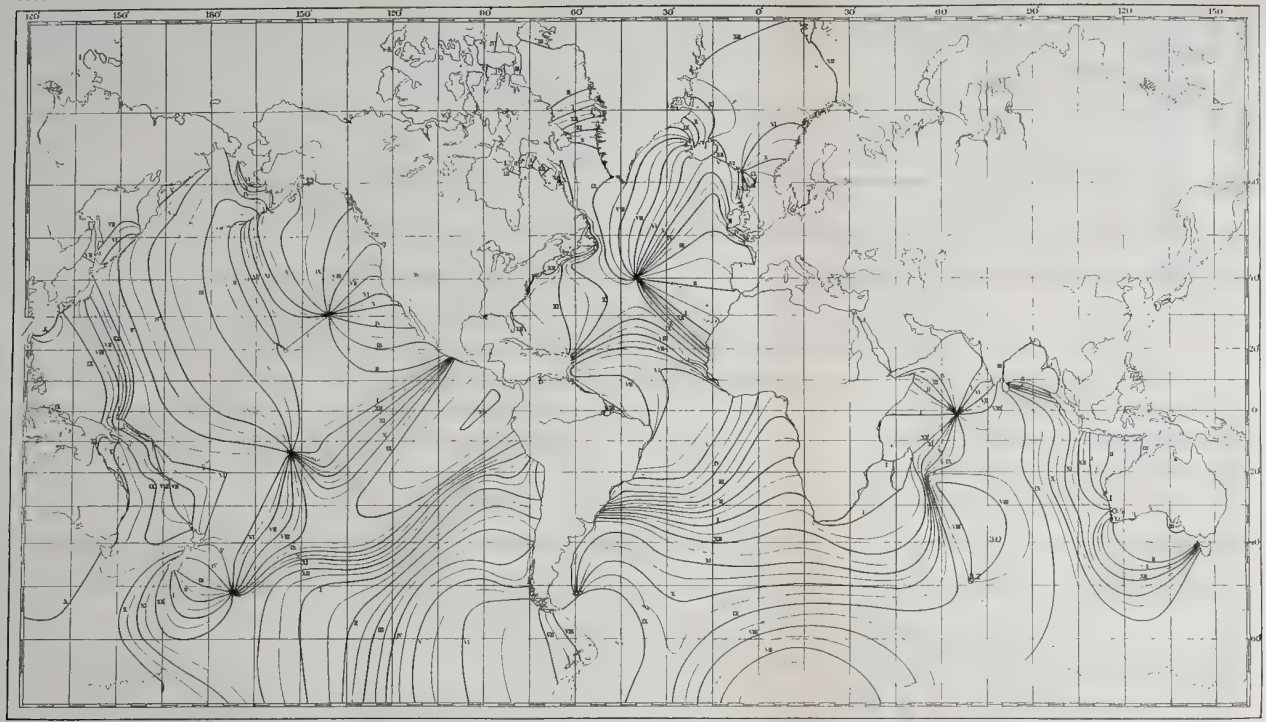
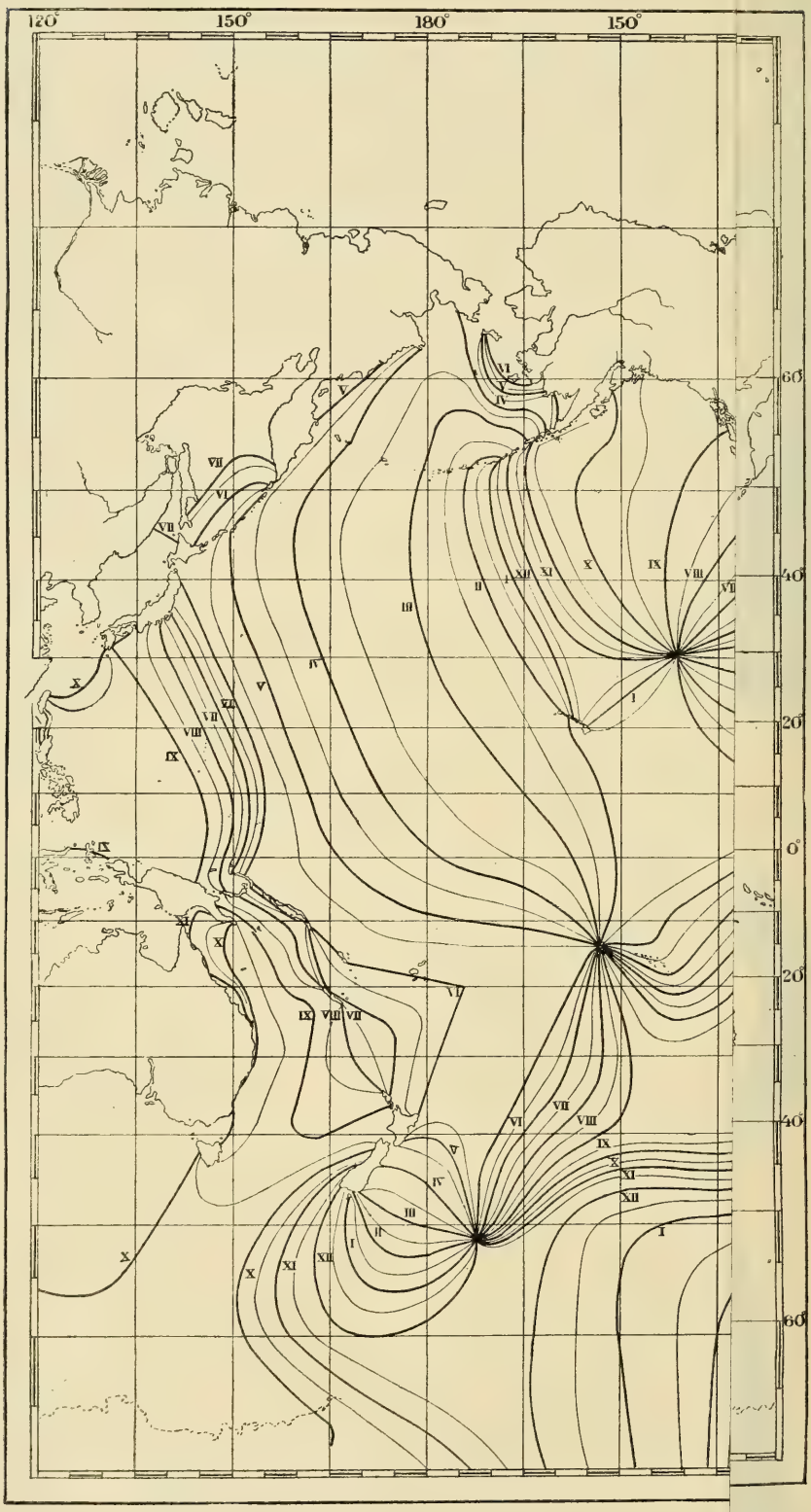


COTIDAL LINES FOR THE WORLD; OR LINES OF SIMULTANEOUS HIGH WATER AT EACH HOUR AND HALF HOUR OF GREENWICH LUNAR TIME



COTIDAL LINES FOR THE WORLD; C ICH

VOL. XVII, No. 6 WASHINGTON JUNE, 1906

THE NATIONAL GEOGRAPHIC MAGAZINE

COTIDAL LINES FOR THE WORLD*

BY R. A. HARRIS

U. S. COAST AND GEODETIC SURVEY

BEFORE calling attention to the accompanying charts, which are supposed to represent the lines of simultaneous high water at each hour and half hour of Greenwich lunar time, it seems well to remark that many systems of lines could be laid down which would satisfy all reliable data; for, with very few exceptions, observations away from land have never been attempted. In fact the lines could generally be drawn across the land instead of the water, the only requirement being that they be so numbered as to agree with the known times of tide along the coasts.

On account of the difficulties connected with the mechanism of the tides, and the want of sufficient data, it has heretofore been possible to incorporate but little rational theory into the charts of cotidal lines covering oceanic depths.

The object of this paper is to give a general idea of a system of cotidal lines for semi-daily tides so constructed as to agree closely with observational data and tolerably well with rational theoretical considerations. Numerous cotidal charts covering various parts of the world, including those here shown, together with a more detailed account of the tides represented upon them, constitute an appendix to the report of the Coast and Geodetic Survey for the year 1904.

Upon referring to the chart of the world (Supplement) it will be seen that even for oceans where the depth is fairly uniform the cotidal lines are in some places crowded together and in other places spread apart. The range of tide also undergoes great changes in value, as will be noted later on.

One nearly simultaneous region whose tidal hour is XII extends easterly from the Atlantic coast of the United States, the range of tide decreasing from about 4 or 5 feet along this coast to one foot on the northeastern coast of Porto Rico. In going southeasterly from this island the time of tide changes rapidly, and the range of the semi-daily tide is less than one foot throughout the greater portion of the Lesser Antilles. If the tide of this region forms part of a stationary wave of which the United States is an end boundary or loop, the Greater Antilles a lateral boundary, and whose nodal line lies easterly from Porto Rico, we ask at once, Where are the other loops, lateral boundaries and nodal lines? Is there a VI hour region which can be associated with the XII hour region? When it is

*An address to the Eighth International Geographic Congress, recently held in the United States.

high water along the coast of the United States, is it low water at a distance of ½ (*i. e.*, half a wave length) to the southeast? For a depth of 3,000 fathoms ½ λ is, by computation, 46.6 degrees of a great circle. This carries one from the American coast to a point southwesterly of the Cape Verde Islands; and here it will be seen the lines indicate that the tidal hour is approximately VI. But they indicate more, namely, that there is a region of considerable size over which the time of tide changes by only a small amount. The lateral boundaries consist of the northeastern coast of eastern Brazil, the African coast from Liberia to Bijouga Islands and the Cape Verde Islands.

Having shown the existence of a stationary wave in the ocean, we may now briefly consider what systems of stationary waves or oscillations are possible in the various oceans. Without going into details, it may be said that the regions or "areas" considered must have depths and horizontal dimensions such that their free periods of oscillation approach 12 lunar hours, or the period of the tidal forces by which the motions are sustained.

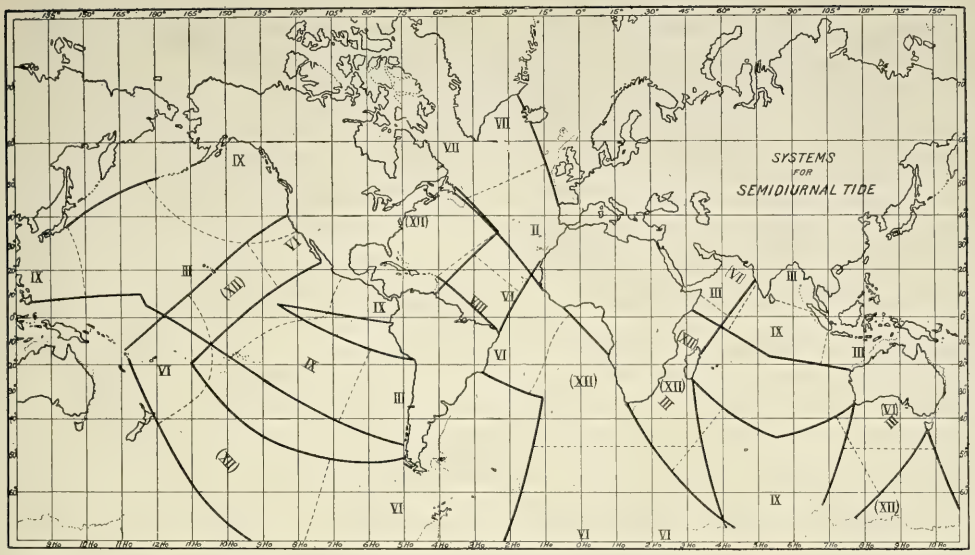
The determination of the free period and mode of oscillation of a body of water is usually a difficult mathematical problem, even when the depth is uniform, the boundaries are simple, and no account is taken of the deflecting force of the earth's rotation. If some of the boundaries are wanting, the oscillation is somewhat imperfect in its character and has not been investigated by mathematicians or physicists. A few experiments will, however, convince one that he can often obtain through the consideration of simple bodies an approximation to the periods of bodies having variable depths and having imperfect as well as rather complicated boundaries.

The systems or combination of "areas" possessing a period of approximately 12 lunar hours are shown on an accompanying chart (page 305) and may be briefly described as follows:

The North Indian system covers the more land-locked portion of the Indian Ocean. The South Indian system extends from the south coast of Australia southwesterly to the Antarctic Continent and thence northwesterly to Madagascar and South Africa. The South Atlantic system extends from the Antarctic Continent north, partly to Madagascar and South Africa and partly to the 27th parallel of south latitude west of South Africa. From this parallel one branch extends west-northwest to the eastern coast of Brazil, and another northwesterly to the Atlantic coast of the United States. The North Atlantic system extends northeasterly from the northeastern coast of Brazil to points west of Morocco; thence northwesterly to Greenland and Labrador. The South Pacific system comprises a belt extending from southern Chile and Graham Land westerly and northwesterly to the islands and shoals north of New Zealand; thence northeasterly to the coast of southern and Lower California. The North Pacific system extends over nearly all of the North Pacific Ocean and also covers a broad band extending from Chile westerly to and joining the North Pacific Ocean.

The tidal forces acting upon these systems cause the tides to occur at times which can be approximately determined *à priori*. Such times are written upon the loops of the systems, and in all cases approximately agree with the observed times of tide for these localities.

Upon referring to the chart of cotidal lines, it will be noticed that some of the loops of the systems are more conspicuous than others. For instance, the time of tide is nearly simultaneous over a considerable region at each of the following loops: East of Brazil, off Sierra Leone, off the Atlantic coast of the United States, off Gibraltar, off Panama, and off the Philippine Islands. Extensive progressions conceal in great measure the stationary waves occurring in the following localities: Between Java and northwestern Australia, near Cape Good Hope, near Cape Farewell, and along the coast of Chile.



Systems of Semi-diurnal Tide

The overlapping of systems obscures the loop around Cape Guardafui and the loop along the coast of southern and Lower California.

The proximity of a loop or region to a loop or region having a different tidal hour necessitates a somewhat gradual transition of the tidal hour as we pass from the one locality to the other. This tendency is quite universal, because in the irregularly shaped bodies of water found in nature it would be unreasonable to expect to find extended nodal lines and much less regions of any considerable extent having no tide at all.

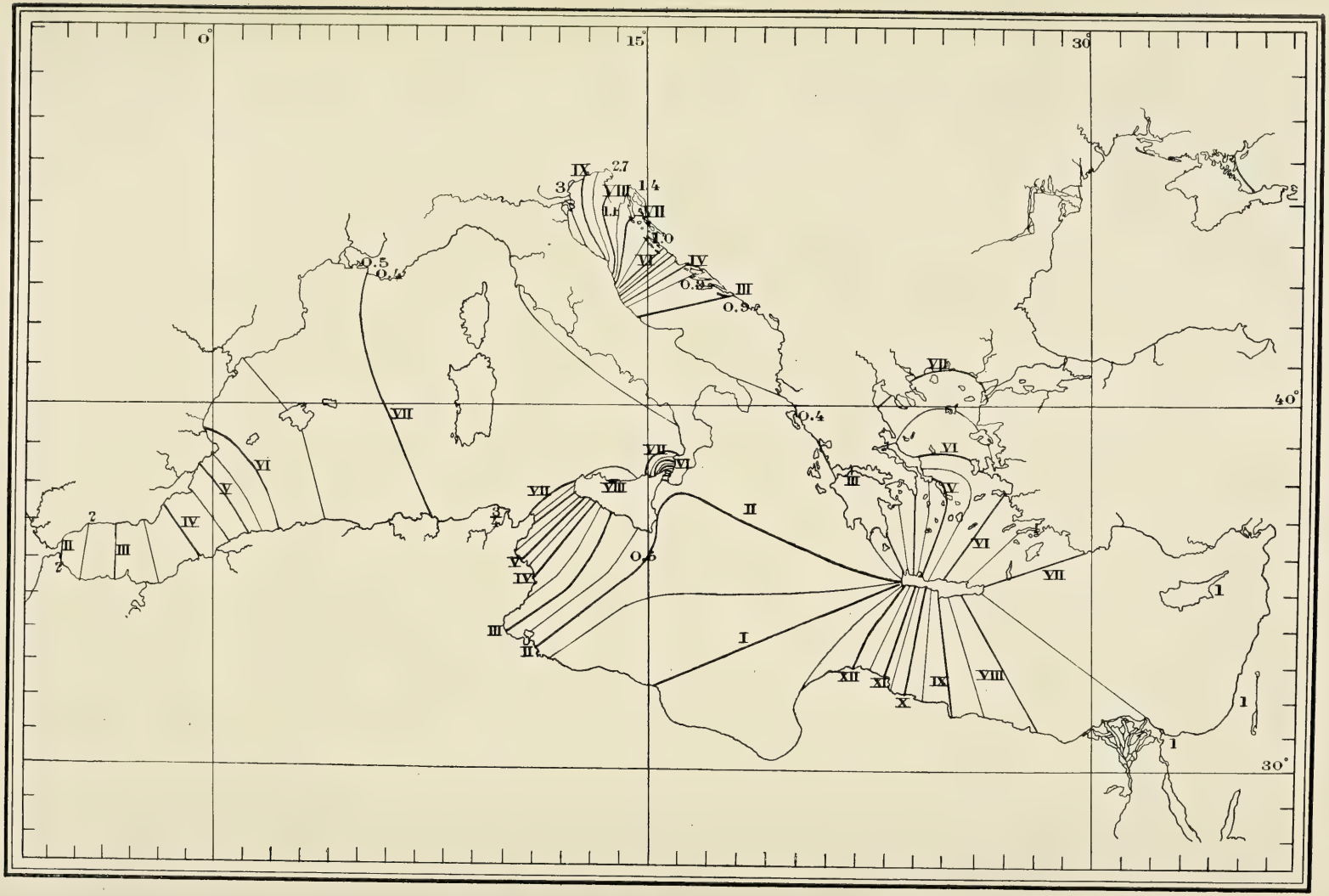
Several good approximations to nodal lines are noticeable through the crowding together of the cotidal lines: One extends from Ceylon to Sumatra; another extends northeasterly from the Windward Islands; another southwesterly from near Acapulco; another southeasterly from Japan.

Upon referring to the chart of cotidal lines, it will be noticed that there are several points from which the cotidal lines for all hours seem to radiate, and so must be points where the range of tide is zero. These points and radiating lines are caused by the overlapping of systems, by progressions due to secondary or dependent bodies of water into which a free wave progresses, and by the necessity of a gradual change between adjacent regions whose tides are not simultaneous.

The existence of such a point can be readily seen in the case of a square area having two stationary waves at right angles to each other, but differing in phase by some amount other than 0° or 180°. The no-tide point will be located at the intersection of the two nodal lines. Around this point the tidal hours will progress, completing a cycle of values in the period of the oscillation. Hence the radiating cotidal lines.

One, two, or three of the causes alluded to may be instrumental in bringing about a no-tide point around which the cotidal lines may be styled "amphidromic."

The no-tide points and amphidromic regions in mid-ocean are located as follows: Between Madgascar and southern Hindostan; westerly from the Azores; between California and the Hawaiian Islands; northwesterly from the Society Islands, and southeasterly from New Zealand.



Cotidal Lines for the Mediterranean Sea

In straits or channels are amphidromic regions caused by the deflecting force of the earth's rotation acting upon a stationary oscillation which otherwise would possess a nodal line. Examples of this are the North Channel, the arm of the North Sea between Holland and England, Norton Sound, and the Strait of Korea.

There are still other amphidromic regions due to other causes.

It has been supposed that the tides of the ocean advance westward around the globe, endeavoring to follow the moon in her apparent diurnal course in the heavens. A westerly progression was especially looked for in the southern seas, where a continuous zone of water encircles the earth. But what have we in reality? A remarkable eastward progression in the Pacific Ocean due to the opening between Cape Horn and Graham Land forming a break in the rigid boundary which constitutes the eastern support of the South Pacific oscillating system. The tide thus derived extends into the Atlantic as far north as Uruguay. By going eastward along the outer coast of Antarctic Continent from 10° east longitude to within 45° of the starting point, it is probable that whatever progression exists is easterly and not westerly, but no observations for the Antarctic Continent are available.

The tides in the Arctic Ocean proceed easterly from Greenland Sea to Bennett Island, Alaska, and northwestern British America.

The progression is easterly in the eastern half of the Indian Ocean.

Excepting off the northern coast of South America and off the southeastern coast of the United States, the progression in the Atlantic is generally to the north. This is due to the large openings in the far north through which tidal action is transmitted, to the particular trend of the continental coast lines, especially that of the western coast of Africa, and to the continuity of the Antarctic Continent.

The general progression in the North Pacific is westerly, due largely to there being many wave-producing openings located on the western side of the ocean, while none are located on the eastern side.

In small deep bodies of water the tide obeys the equilibrium theory, *i. e.*, the surface of the water remains normal to the direction of instantaneous gravity. Examples of this are Lake Superior, the eastern portion of the Mediterranean Sea (page 306), the southwestern corner of the Gulf of Mexico, and of the Caribbean Sea.

RANGE OF TIDES

A few examples will now be given for the purpose of showing that, unless obscured by other effects, relatively large ranges occur near the loops of the oscillations and relatively small ones near the nodal lines.

The range of tide between Ceylon and western Sumatra is probably less than 1 foot, while off the mouths of the Ganges the range is about 5 feet.

At the northern end of Mozambique Channel the range is 9 feet, while around Ras Hafun, Somaliland, the range is about 3 feet; going thence northerly, the range again increases, being 5.6 feet at Karachi and 8.8 feet at Bombay.

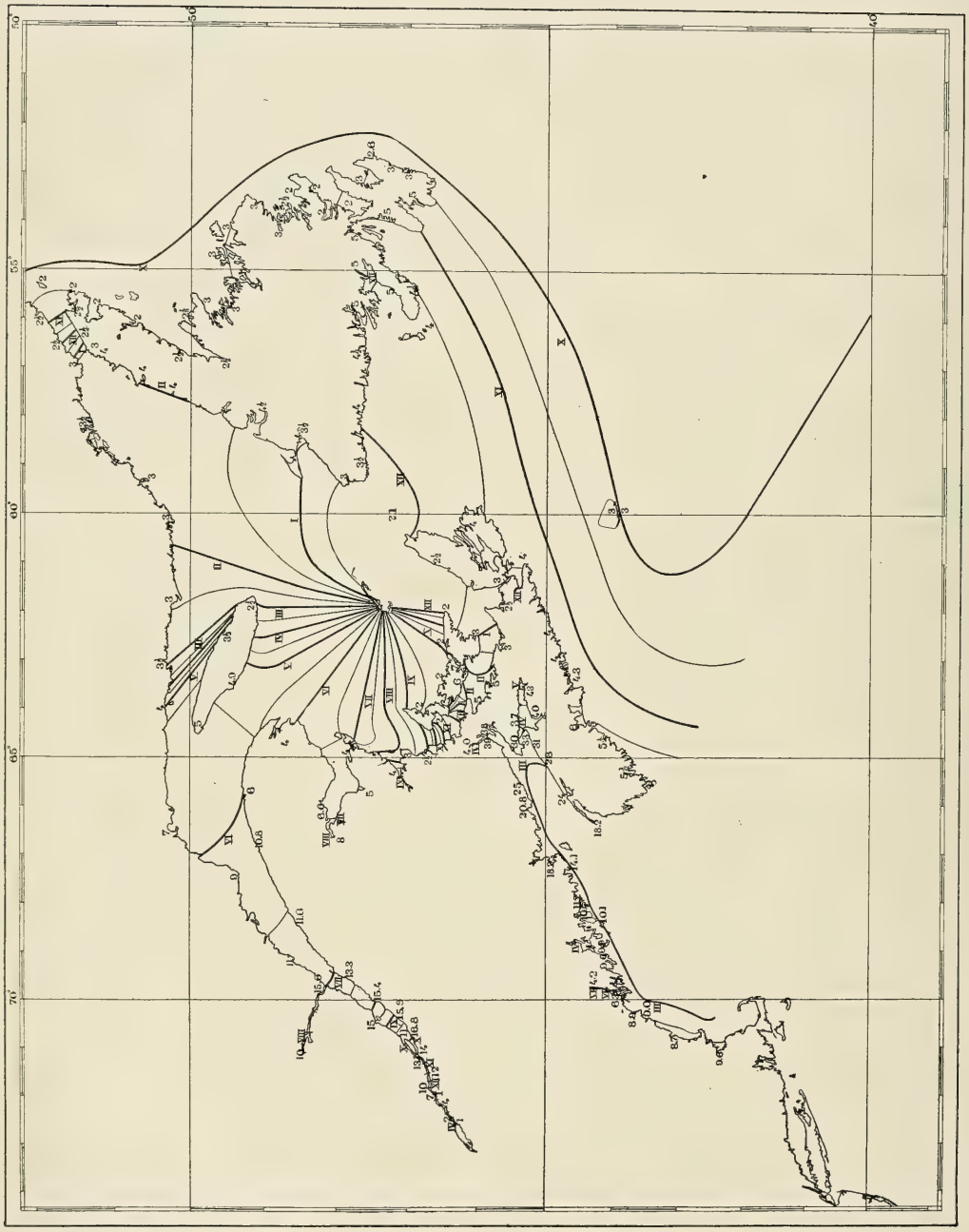
The range of tide at Savannah River entrance is 6.8 feet, while on the south side of St Thomas Island it is but 0.3 foot.

The range of tide at Panama is 12.6 feet, while at Acapulco it is but 1.2 feet.

(It has already been noted that the tide of southwestern corner of the Caribbean Sea obeys the equilibrium theory. The observed range at Colon is 0.6 foot.)

On the eastern coast of the Philippine Islands the range of tide is 4 feet, while at the Island of Guam it is 1½ feet.

In many land-locked arms of the sea the difference in range at loop and node is still more apparent. Examples of this are the Gulf of Suez, the English Channel, and the Irish Channel. I shall con-



Cotidal Lines for the Gulf of Saint Lawrence

clude this paper by noting the variety of ranges occurring in the Gulf of St Lawrence and the Gulf of Maine (page 308).

The cotidal lines indicate a nodal line north of the Magdalen Islands. East of this the range increases to about 3 feet in Cabot Strait, while to the west the range increases rapidly. At the mouth of the Saguenay River it is 15 feet. Above this point the wave is progressive, while below this point it is chiefly stationary. At one point on the south side of Nantucket Island, the range of tide is 1.2 feet; at Boston, it is 9.6 feet; at St John, 20.8 feet; at the head of the Bay of Fundy proper, 30 feet; at Moncton, 40 feet, and at the head of the Basin of Mines, 43 feet.

From C. C. Georgesen, Department of Agriculture

A Garden at Eagle, Alaska (64° 45′ north latitude), where the temperature varies from 87° F. in June to — 68° F. in January

Mr C. C. Georgesen, director of the four government experiment stations in Alaska, in "Vegetable Growing in Alaska" (Bull. No. 2, Alaska Agric. Exp. Stations, published by the Department of Agriculture), gives an interesting summary of the work. Radishes, mustard, turnips, kale, lettuce, carrots, parsnips, parsley, peas, cress, cabbage, cauliflower, broccoli, Brussels sprouts, onions, spinach, endive, leek, beets, potatoes, rhubarb, and, among the herbs, caraway, catnip, marigold, mint, sage, thyme, can be grown anywhere in the coast region in Alaska, and in the interior nearly to the Arctic Circle if the gardens are selected with due reference to shelter and exposure to the sun. Asparagus, beans, celery, cucumber, squash, salsify can be grown in favorable seasons if planted in warm spots and given the proper care and protection. Vegetables which cannot be grown in Alaska out of doors under ordinary garden culture are: sweet corn, melons, tomatoes, peppers, eggplant, pumpkins.

WHERE THE WIND DOES THE WORK

By Collier Cobb

Professor of Geology in the University of North Carolina

NO portion of the North American Continent is so widely known, and at the same time so little known, as the chain of low-lying islands and fringing sand reefs extending along the North Carolina coast for a distance of more than three hundred miles. This is especially true of Hatteras Island, a sand spit whose dangerous projection and shifting shoals have made this portion of our Atlantic seaboard a veritable graveyard of American shipping.

Distinguished scientists on both sides of the Atlantic have discussed the origin of Cape Hatteras without having set foot on the island or coasted along its shores. The origin of well nigh all the features of this coast have been discussed at long range, and yet hardly half a dozen people from the outside world have any personal acquaintance with the island.

It was on this coast that Fessenden and Thiessen experimented successfully with wireless telegraphy. At Kitty Hawk, on these banks, the Wrights conducted their experiments in mechanical flight.

Though difficult of access, the inhabitants of these islands are in close touch with the rest of the world by means of the telegraph and telephone lines of the U. S. Weather Bureau and the Life Saving Service, as well as by the wireless telegraph.

Sail Car on Church's Island, N. C.

Those who watch the reports of shipping need not to be told that winds are constant in this region. The strong winds of midwinter come from the north, and the gentler steady winds of midsummer and of the greater part of the year blow usually from a little west of south.

These constant winds were early taken advantage of by the inhabitants, and windmills for grinding corn dot the whole chain of islands, though most of them have now fallen into disuse. A small boy on Church's Island hauls freight for the people of his village on a car furnished with a sail and propelled by the wind.

The frequency of wrecks upon this coast is too well known to require comment, though such is the efficiency of the life-savers, who brave the perils of any storm, that life is

Map of Sand Reefs Along the North Carolina Coast

rarely lost here; but the lightship has sometimes been broken from its moorings on Diamond Shoals and driven upon the Hatteras Banks.

The strong north winds pile the sands up into great barchanes or medanos, crescentic sand dunes known locally as whaleheads, which are moving steadily

Shackleford Sandwave advancing on Forest

Wind-mill on Harker's Island, N. C.

Forest covered by Shackleford Sandwave

southward. These are best developed along the Currituck Banks, from Virginia as far south as the Kill Devil Hills, and numbers of them may be seen to the north and to the south from the top of Currituck Light. These whaleheads are composed of singularly homogeneous blown sands, the horns or cusps of the barchanes pointing to leeward, which is almost due south.

The prevailing winds from a little west of south have rippled the heterogeneous sands on Hatteras just south of the cape, on Shackleford at its southwest extremity, and on the southwest side of Smith's Island. These wind ripples, started in sands exposed by the removal of a strip of forest next the shore, have grown in size to great sand waves, which are advancing on forests, fields, and homes. As the sand wave has advanced it has taken up several feet of the loose soil over which it has passed, undermining houses, laying bare the roots of trees, and exposing the bones of the dead in the cemeteries.

Diurnal winds from the sea have piled the sands into small wandering dunes and hillocks, and even sometimes into sand waves, which are marching steadily inward and shoaling the waters of the sounds. At Nag's Head a large hotel, constituting a solid obstruction, soon had a sand wave built up a short distance in its rear until the level of its roof was reached, when the wave moved forward and engulfed the hotel. In the immediate neighborhood two cottages suffered a similar fate. Here the land gained on the sound 350 feet in 10 years.

On the northern end of Hatteras Island a fishing village has been similarly buried, while the sand has entirely crossed the island at several places north of the cape. This movement of the sand was started just after the Civil War by the cutting of trees next the shore for ship timbers, and the section is still known as The Great Woods, though not a stick of timber stands upon it today. Pamlico Sound for two miles from the Hatteras shore is growing steadily shallower from the deposit of blown sand.

On Smith's Island a pilot's village has

The Wreck of the *Priscilla*

been buried beneath the sand wave for a number of years, but this has been quite recently resurrected and its houses are again occupied. On Currituck, below Caffey's Inlet life-saving station, the sand has advanced entirely across the land, and one man, moving before the advancing sand, has at last built his house on piles in the sound.

The writer has found by experiment that heterogeneous sands, consisting essentially of quartz, orthoclase, some mica, iron, bits of shell, and many mineral substances, showing little if any decomposition,* ripple readily in the wind and are easily arrested. This he accomplished in one instance by planting the seed of a native pine and covering the dune with brush. In another case the movement was checked by the unassisted growth of grass upon dunes from which hogs and cattle were fenced out. Several native grasses on these islands are excellent sand-binders; but so far he has found no means of checking the movement of homogeneous sands that do not ripple, these consisting entirely of well rounded and wind-sorted quartz grains of the same size throughout a single dune.

Cemetery on Hatteras Island, N. C., laid bare by the winds

Other trees besides the pine may be used as sand-binders. Some live oaks and myrtles serve well in this capacity, and on Hat-

* I consider these sands to be of glacial origin, scraped off the granite rocks of New England by the ice-sheet of the last glacial epoch.—C. C.

Wreckage above Hatteras

teras Island young olives and palms have been observed growing on the dunes, though this is the northern limit of both these trees, and they are even unknown on Ocracoke Island next to the south.

As already pointed out, the movement of these sands was in every case started by the deforesting of a strip of land next the shore; but in several instances nature has herself grown forests on dune sands. Above Kitty Hawk Bay large dunes are covered with a growth of pine, maple, oak, cedar, sassafras, elm, locust, beech persimmon, sycamore, hickory, and, in the damp interdune areas, gums and cypresses. Here are many veteran pines, some of them having attained a diameter of three feet. An essentially similar forest is found growing on the high dunes to the southwest of Cape Hatteras, but here we have to add the olive to the list, and there are broad interdune palmetto swamps.

On Bogue Banks, where deforesting has only just begun at two points, we have 20 miles of woodland, the virgin forest extending down to the water's edge and preventing the formation of dunes.

From Southport westward into South Carolina the dunes have moved northward and inland, in some places completely filling the lagoons. At one point such a filled lagoon has produced a pine forest in something more than forty years.

The checking of these moving dunes presents a problem of increasing importance not only to the inhabitants of these sand keys, but to the navigators of the inland waterways as well, and it is of interest to know that its solution is at hand, and that the encroachment of the sand upon the land and upon the sounds may be effectually stopped.

It is fortunate that the strong north winds that pile up the sands and the strong east winds that cause the greater amount of the sand movement blow in the winter months rather than in the season of plant growth. The spring rains are usually of light intensity and long duration, and on Hatteras Island at least they come with the gentler south-

Palmettos on Smith's Island, N. C.

west winds. Hence it is comparatively easy to plant grasses and shrubbery in late winter or early spring and have them gain a firm footing and accomplish something of their growth before the strong winds come.

In January, 1886, the writer planted the seed of the loblolly pine on the back of a dune and covered the area with brush cut from a near-by road in process of making. The brush served not only to break the wind but to conserve the moisture of the sands, and today there is a forest of several acres where twenty years ago was a moving sand waste. The method so common abroad of building a barrier dune by means of wind breaks has been tried several times along this coast, but always without success.

The atmospheric humidity of Hatteras Island is greater than that of any other station in the United States except in the Puget Sound region, and even there the excess over Hatteras is not great. Yet there are more days of sunshine on Hatteras than at Cape Henry, or Norfolk, or Wilmington. The heaviest rains come between late July and mid October, after the plants have done most of their growing for the year and when plants in many parts of the country are suffering greatly from the drouth.

The people of these islands are not the slothful bankers and rude wreckers pictured in song and story. They are fair women and brave men, most of whom live and do for others — life-savers, heroes. Their homes are comfortable and well kept; they attend regularly upon the services of the church, and their children are in school for eight months of the year, for the inhabitants of Dare County have voted upon themselves a special tax for this purpose. The islanders have herds of small wild ponies and flocks of sheep and goats, as well as cattle, on some of these islands.

True, some primitive customs are preserved among them and some early English forms of speech. Their lodges used in fishing and hunting are built after the most primitive type of straw thatch, while a higher type, similar to that used in the village of Gabii in the days of Romulus and Remus, is used as a temporary residence during their camp meetings in the summer, and this higher type of dwelling is on Hatteras built of palmetto thatch.

Making Fishing Nets, Manteo, N. C.

There is no better type of the average man than the native North Carolina banker.

The possibilities of these islands are as yet undreamed of by their inhabitants and utterly unknown to the outsider, who visits only the most barren of them in the duck-shooting season.

The regaining of the shore strip by reforesting the sands, and the retention of the dunes that are devastating the meadow lands, would make of Hatteras Island, at least, a subtropical garden, where southern fruits and early vegetables once plentiful here might come into the market. The game still lingering among the wooded dunes would be greatly multiplied, and the herds of wild ponies now dwindling away would again increase in numbers. Then conservative lumbering could be added to the industries of the island.

It is also within the range of possibilities that the black beach sands which are concentrated by wave action at a few points might be made to yield from their iron ores a return for the labor of gathering them.

THE ERUPTION OF MOUNT VESUVIUS, APRIL 7-8, 1906

By Thomas Augustus Jaggar, Jr.

Assistant Professor of Geology, Harvard University

THE writer's first near view of the volcano after the eruption of this year was on the afternoon of April 24, when he took his way toward Dr Matteuci's observatory. The electric train was pushing slowly with its cogged wheels upward toward the observatory station; beyond that point the road was destroyed. The fields outside of Naples showed one or two inches of dust, brown, gray, and gray-green, but most of the vegetable gardens had been cleared of it. A little farther the pines and palms were heavily loaded with sand, as in a snowstorm. It was three inches deep on the walls. It had drifted in places to a depth of two or three feet. On nearing the observatory the lava fields of 1872 and 1898 were found buried under 5 or 6 inches of sand and dust, which formed a heavy mantle, but not sufficient to wholly disguise the slaggy contortions beneath. The whole cone of Vesuvius became cleared of clouds in the course of the afternoon and it was seen to be covered with straight sand slides of whitish-gray color which occasionally slipped downward as on the steeper

Looking Down into the New Crater of Vesuvius, April 25, 1906

The Cauliflower Cloud from above Vesuvius, April 7, 1906

The Ruins of Boscotrecase, 1906, the Work of Flowing Lava. The stone heap on the left is lava

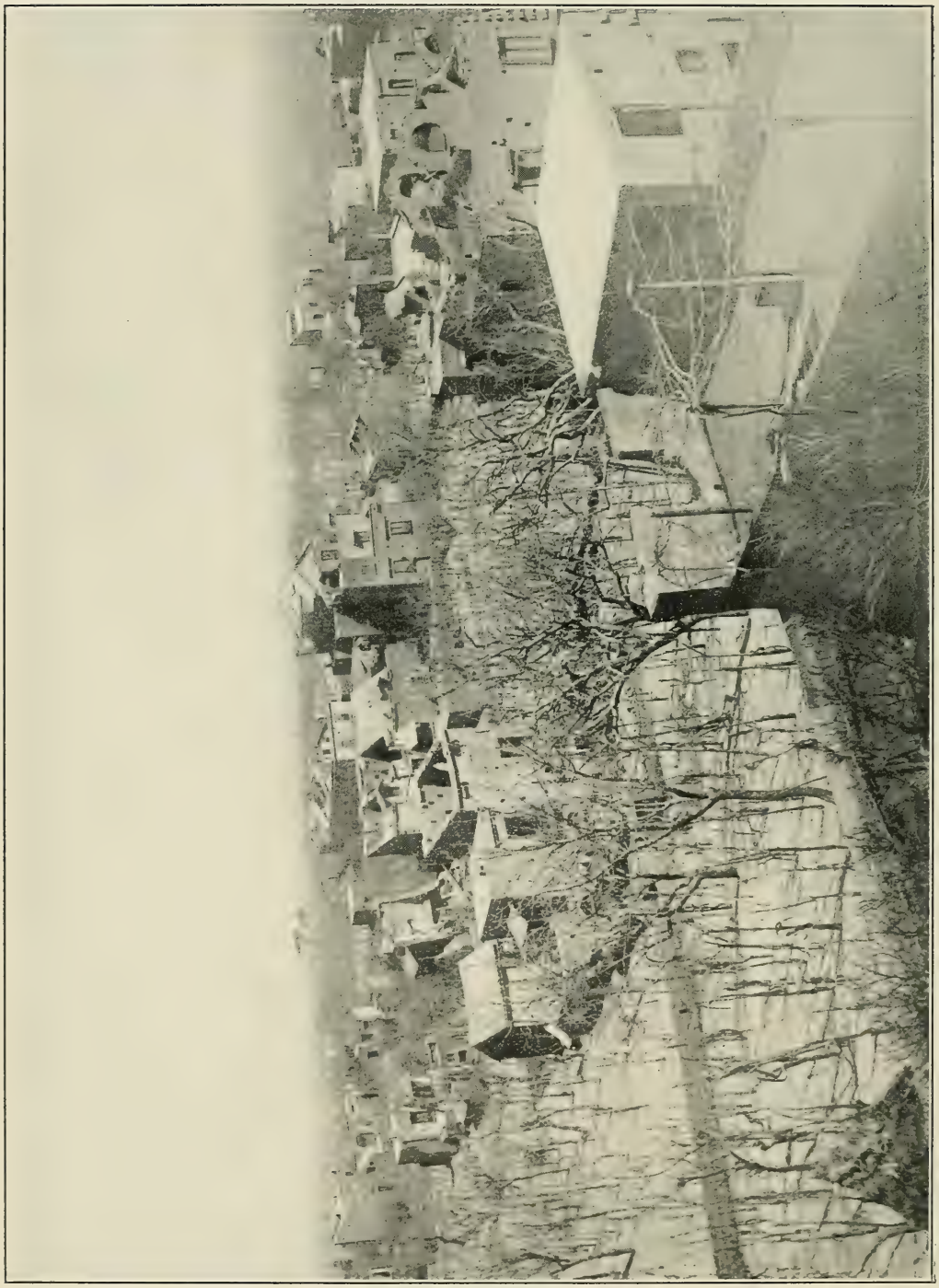
slopes of a dune. Pure white steam boiled up slowly from the crater. In one instance it burst out radially over the edge of the crater, showing a ring on the border, a dome of cumulus above and within, and a second still higher outer ring made of an older rain-cloud which had been punctured and pushed up bodily. The effect was like a hat on the mountain's crown. At night the cone was clear and entirely without luminosity. Professor Matteuci was found on his return from an ascent, in which he had been accompanied by Dr Sjögren, of Stockholm, and Mr Perret, a graduate of the Brooklyn Polytechnic. They had been in the clouds, and their faces were most picturesquely plastered with blown dust, but they had been unable to see anything, so dense was the fog of steam and sand.

The next morning, with a strong west wind, we started up. Besides the writer, the party consisted of three members of the Alpine Club of Great Britain and a guide. The Alpineers were Dr Tempest Anderson and Messrs Yeld and Brigg, all of Yorkshire. The steam was settling down in clouds on the summit from time to time, in alternation with clear spells. The route followed the extension of the tramway to the place where the lower Funicular station had been, and then the western profile of the cone was followed straight up. The rails along the foot of the cave had been twisted and torn by landslides. Most of the old track and the lower station were buried, but not under lava. No new lava was anywhere

A Pine Tree Overwhelmed by Lava, Boscotrecase, 1906

visible on this side of the mountain. Everything was covered with pebbles, sand, and dust. Vesuvius was never more completely a "cinder cone" in outward appearance than it is at the present time. The slope of the main cone averages about 29°, and the ejecta seem to have slipped down this slope to form thick taluses at the bottom. Here and there large angular pieces of hard rock have fallen, up to 5 feet in diameter.

Climbing the cone was not especially difficult, though it was very steep in places. By making a somewhat zigzag track and keeping on the radial elevations rather than in the shallow troughs, hard pan could be found to walk upon. Some of this was scoured old hard lava, otherwise it was closely wedged or plastered fragments, whereas the gullies were filled with deep sand. It was necessary to be very cautious to avoid starting rocks down on those below. The steepness increased up to a point near the edge of the crater, and then it became slightly less. The edge of the crater itself is the upper rim as seen below; there are no intervening ridges. Therefore the abruptness of the fall-off, when we finally came to it, was startling in the extreme. The wind had steadily increased and was pelting our necks with stinging sand grains which surged in whirling clouds all about us. It was impossible to face this bombardment except during lulls in the gale; hence photography was accomplished under difficulties and the flying dust was ruinous to cameras. Only occasionally did the dim sunlight sift through the mixture of sand, steam, and cloud. In those lucent intervals, however, we could make out an inward slope of 35



The Ruins of Ottajano, April, 1906. The roofs have caved in under the fallen ashes

or more degrees, covered with hot sand and broken rock fragments, terminated about 120 feet (vertically) below by jutting ledges which appeared to be precipitous. Beyond was steam and sulphurous heat and obscurity. The ledges fumed in places. No noise could be heard above the howling of the wind. The curvature of the crater edge was irregular with embayments, and it showed much irregularity in height. We could not see the opposite side of the cauldron, but from the curvature it was estimated that the crater could not be less than from one-fourth to one-half mile in diameter—unusually large for Vesuvius. The summit was 4,000 feet above the sea by Aneroid, or some 350 feet lower than before the eruption, according to the data furnished us by the officers of the observatory. The east-west diameter is much greater than the north-south. The depth of the crater is at least 150 feet and no one knows how much more. There is a great notch or caving-in on the northeast rim of the crater, where thousands of tons of gravel and sand were hurled clear over the crest of Monte Somma and fell on Ottajano and San Giuseppe with most disastrous results. On the south side of the cave, toward Boscotrecase, a radial rift opened, letting lava escape from different elevations progressively lower until finally the great outflow came from a mouth or "bocca" only 2,000 feet above tidewater, half way down the mountain, and quite below the cone proper.

The history of the eruption, as gleaned from the accounts of men of science who were on the spot, is briefly as follows: In 1904 there was a lava flow which stopped in September of that year. In May, 1905, lava flowed from a split in the northwest side of the cone and continued in active motion throughout the year. It ceased flowing at the time when the present eruption opened a new vent on the south side of the cone. On April 4, 1906, a splendid black "cauliflower" cloud rose from the crater. On April 4, 5, 6, and 7 lava mouths opened along the southern rift above mentioned, first 500 feet below the summit, then 1,300 feet lower, and finally 600 feet lower still, all in the same radial line. The lowest mouth was more than half way down the mountain, and from this orifice came the destructive streams. It should be borne in mind that these flows are not floods of lava which cover the whole slope of the mountain, but relatively narrow snake-like trickles, none the less deadly when they push their way through a closely built town. The molten rock crusted over and cracked, making a tumble of porous boulders at its front.

At 8 p. m., April 7, a column of dust-laden steam shot up four miles from the crater vertically. The cloud snapped with incessant lightnings. New lava mouths opened and the flows moved forward, crushing and burning and swallowing parts of Boscotrecase, the stream forking so as to spare some portions of the town. Meantime torrents of ashes fell on Ottajano on the opposite side of the volcano, and many roofs collapsed and lives were lost. At the observatory Dr Matteuci and his colleagues were obliged to retreat, as the observatory was rocking violently and heavy stones were falling.

They went only half way down the mountain, however, and returned to their posts next day. The observatory was uninjured, although stones had fallen weighing as much as five pounds. The stones and sand of the eruption are mostly composed of ancient lavas broken up by the steam blast. On April 8 the electrical dust cloud still hung over the volcano, but thereafter through a fortnight the explosions diminished in violence until only quiet steam rose. On the 18th bad gases were blown downward on the observatory by a strong southeast wind, and some persons nearly lost their lives by asphyxiation. The gases were probably both carbon dioxide and sulphuretted hydrogen.

Boscotrecase was ruined wholly by lava; Ottajano by falling gravel. Boscotrecase is traversed in two places by the clinkery lava stream and in some cases

The New Cone of Vesuvius from the Road to the Observatory, shrouded in Snow-white Ashes

houses were literally cut in two. The stream of lava had forked about a spur of the mountain, leaving the higher land with its vineyards untouched. The lower land with its town was invaded. There is so little timber in the Italian masonry construction that the uninvaded part of the town was not burned at all. At Ottajano the roofs fell in under the weight of sand and gravel. The roofs were largely flat or slightly sloping tiled affairs. The ash and lapilli reached a depth of three feet on level surfaces. The roofs carried the walls with them in many cases, but there was no significant earthquake. There was no fire, destructive lightning, nor strong wind. The persons who perished were all found in the houses, where the sole cause of death was entombment in the ruins.

In both these towns suitable rebuilding might avert a similar catastrophe in the future. Arches and domes are the architectural forms best fitted to shed the sand-fall. Rebuilding on higher land and avoidance of the bottoms might do much to protect such a town as Boscotrecase from another attack of lava.

The Japanese have made systematic experiments to test the resistance of different forms of masonry to earthquake shocks. Similar experiments might well be made on volcano-proof construction, if human beings continue to insist on living within the five-mile limit of an active crater.

THE CALIFORNIA EARTHQUAKE

THE illustrations on the following pages picture very vividly the devastation wrought by the earthquake in California and need no further explanation. The Governor of California has appointed a commission to investigate the earthquake and to report how destruction from future earthquakes may be avoided. The commission consists of Messrs G. K. Gilbert, Andrew C. Lawson, George Davidson, J..C. Branner, H. F. Reid, and A. O. Leuschner, all of whom are well-known American geologists. Until the commission reports there is little to add to the explanation of the earthquake given by Mr Frederick Leslie Ransome in his article, "The Probable Cause of the San Francisco Earthquake," published in the May number of this Magazine. The Japanese government has sent Dr F. Omori, Professor of Seismology in the University of Tokio and inventor of the seismograph, to San Francisco to report on the earthquake.

About 1,400 earthquake shocks are recorded yearly in Japan, but less than 50 of them are sensible.

Photo by L. H. Hicks, Courtesy of The Mazamas

A Difficult Bit of Rock Climbing. This perpendicular cliff (300 feet in height) is just below the summit of Mount Jefferson, middle ridge of the north side

Photo by W. C. Mendenhall, U. S. Geological Survey

Sunken Area on Market Street near the Ferry Building. The street has dropped 4 feet from the curb

Photo from Waldemar Lindgren, U. S. Geological Survey

A Fissure Opened by the Earthquake on East Street

Photo from Waldemar Lindgren, U. S. Geological Survey

An "Earthquake Wave" at Seventh Street and Missouri Avenue at the Corner of the new U. S. Post-office

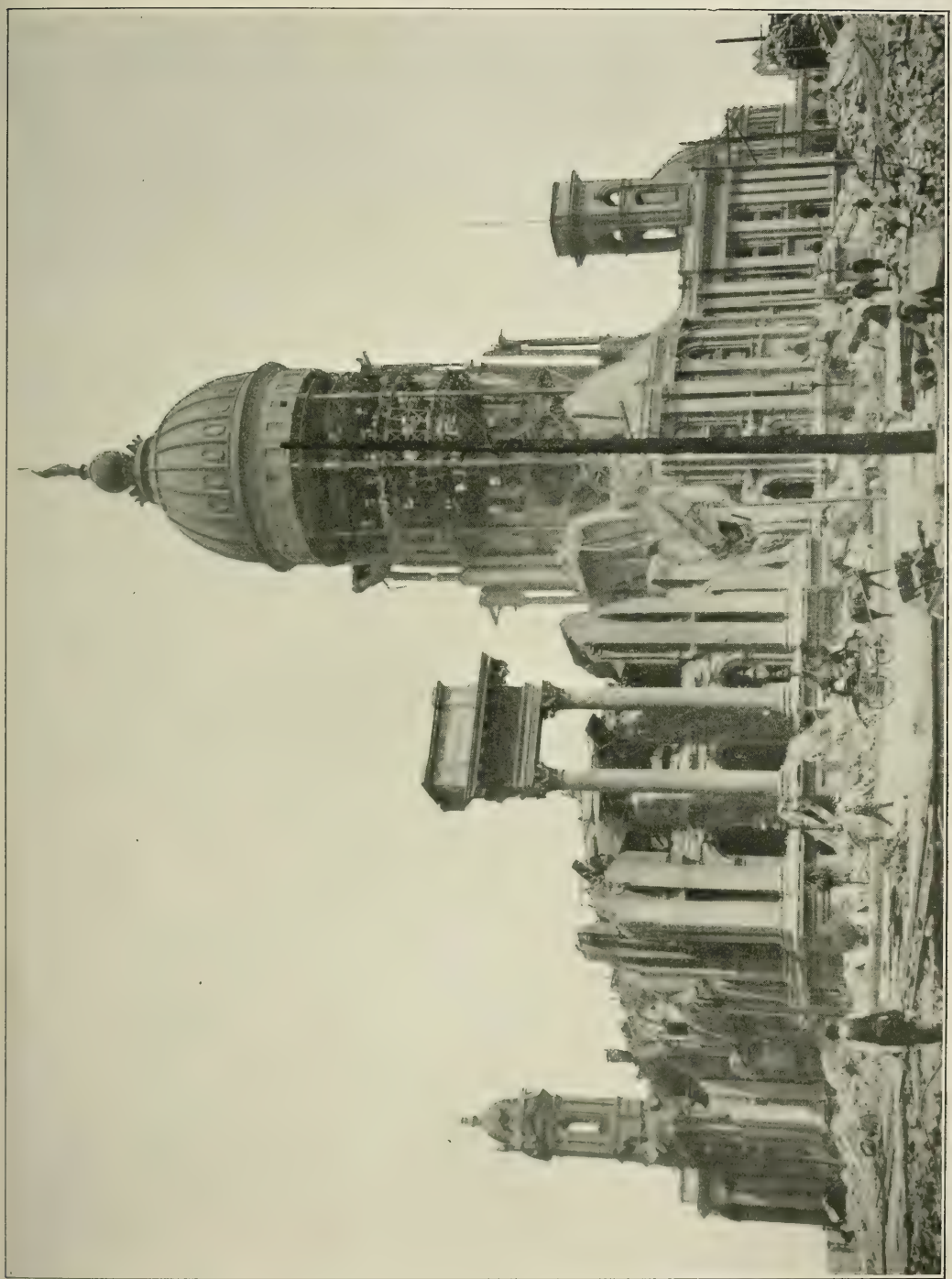


Photo by W. C. Mendenhall, U. S. Geological Survey

The City Hall. Most of the damage on this structure was caused by the earthquake

Photos by W. C. Mendenhall, U. S. Geological Survey

Scenes at Leland Stanford, Jr., University. The Gymnasium and the Library

While the larger buildings of the University were seriously damaged, the lecture halls and dormitories, being one story structures, escaped with slight injury

Photos by W. C. Mendenhall, U. S. Geological Survey

Scenes at Leland Stanford, Jr., University. The Agassiz Statue and the Great Arch

Photos by W. C. Mendenhall, U. S. Geological Survey

Scenes at Leland Stanford, Jr., University. The Chapel and Collapsed Corridor from the rear. The Chapel as it Appears from the Inner Quadrangle

Photos by W. C. Mendenhall, U. S. Geological Survey

Scenes at Palo Alto. Opposite the depot. A Wrecked Building on University Avenue

Photo by T. H. Wilton, U. S. Weather Bureau

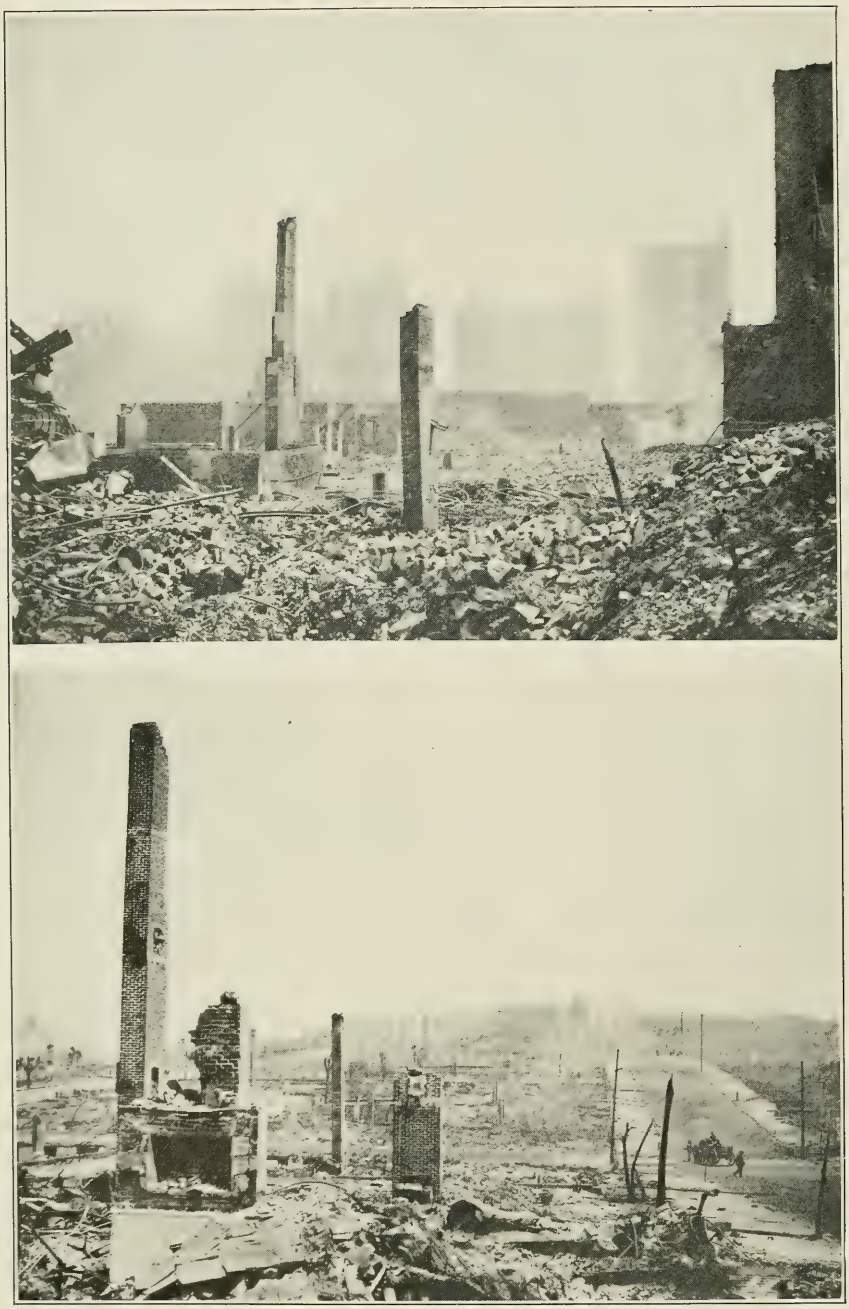
The Two Spires of St Dominic, Destroyed by Earthquake

Photo by W. C. Mendenhall, U. S. Geological Survey

At the Junction of Pine and Market Streets

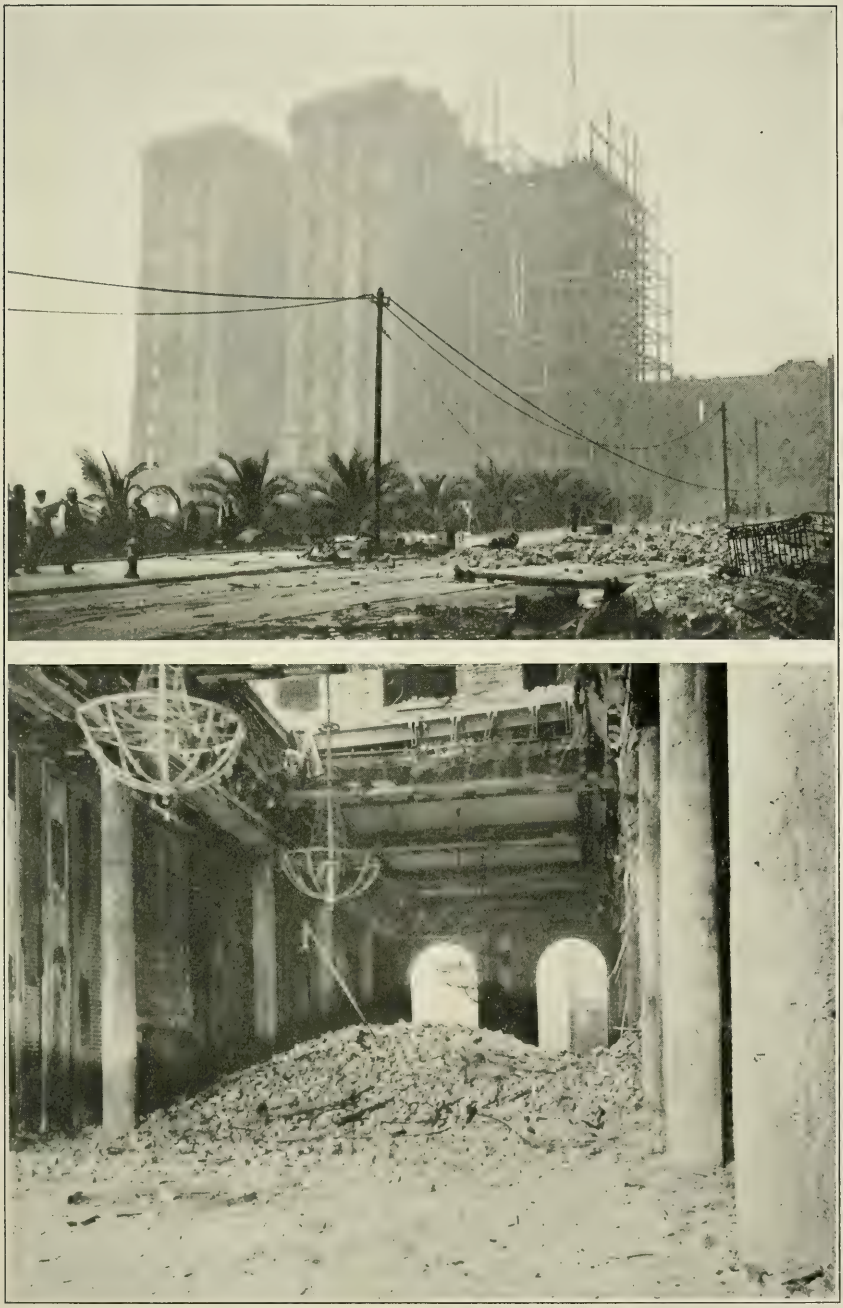
Photo from Waldemar Lindgren, U. S. Geological Survey

Looking down Pine Street, the Nevada Bank on the left. The High Wall on the right is the Stock Exchange Building and Headquarters of the California Miners' Association



Photos by W. C. Mendenhall, U. S. Geological Survey

Looking East from Jones Street. Nob Hill from Van Ness and Washington Streets



Photos by W. C. Mendenhall, U. S. Geological Survey

St Francis Hotel. Blue and Gold Room, St Francis Hotel, after the Fire

Photos by T. H. Wilton, U. S. Weather Bureau

The Commercial High School
St Ignatius Church and College destroyed by Earthquake and Fire.

Photos by W. C. Mendenhall, U. S. Geological Survey

Montgomery Street from Market Street. An Interior

Photo by T. H. Wilton, U. S. Weather Bureau

The Remains of the California Hotel. Fairmont Hotel in the distance. Soldiers marching to Relieve a Squad

Photo from Waldemar Lindgren, U. S. Geological Survey

The Custom House (Appraisers' Building), Corner of Washington and Battery Streets. This building was built by and belongs to the U. S. government, and, like the Mint, escaped with slight injury, though surrounded by burning buildings

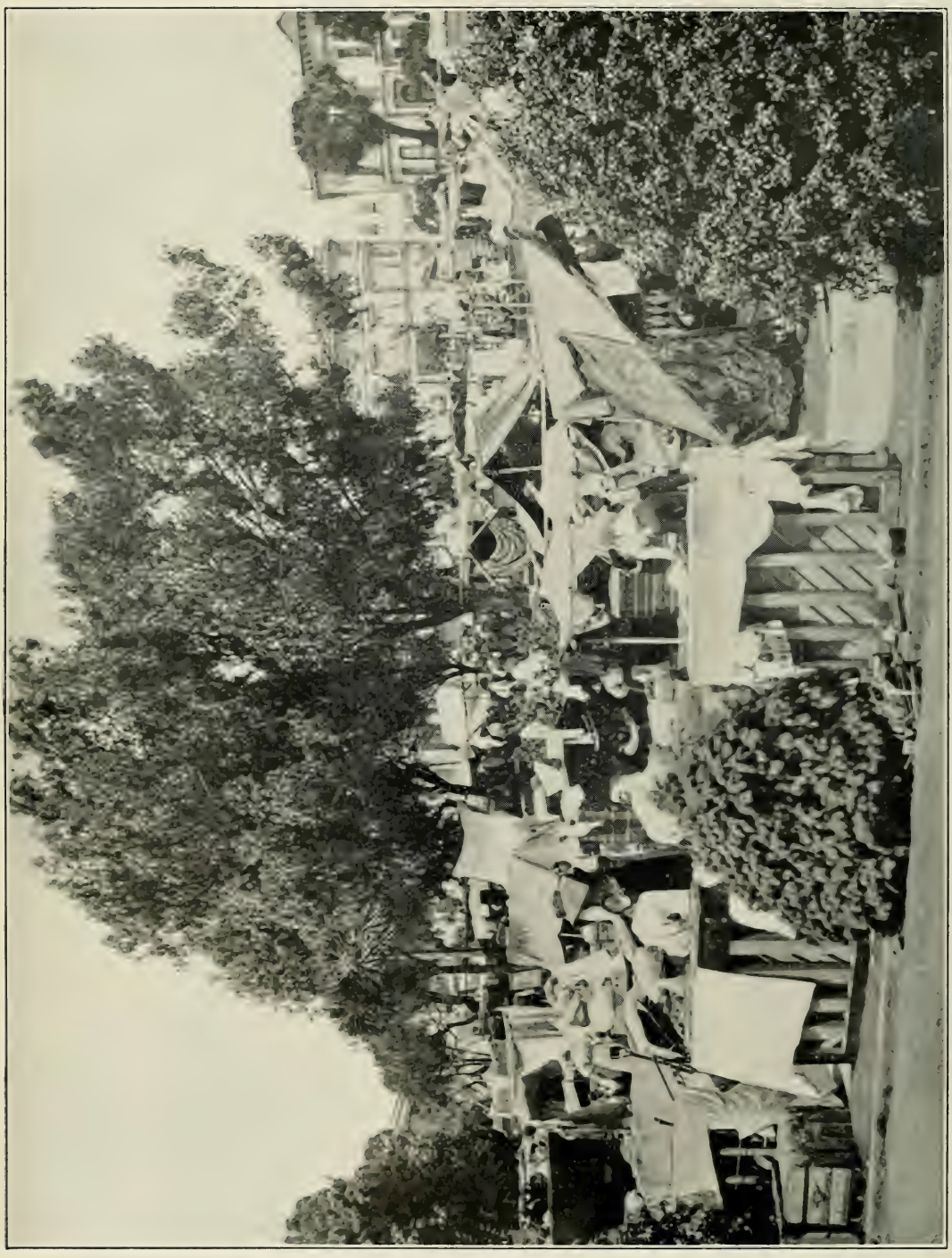


Photo by W. C. Mendenhall, U. S. Geological Survey

Camping Out in Jefferson Square

Photo from Waldemar Lindgren, U. S. Geological Survey

San Francisco Getting Fed. The "Bread Line" at a Relief Station near St Mary's Cathedral. Government Supplies. Note the good humor of the crowd, characteristic of all the people during and since the catastrophe

THE DIAMOND MINES OF SOUTH AFRICA

By Gardiner F. Williams

General Manager of the De Beers Diamond Mines

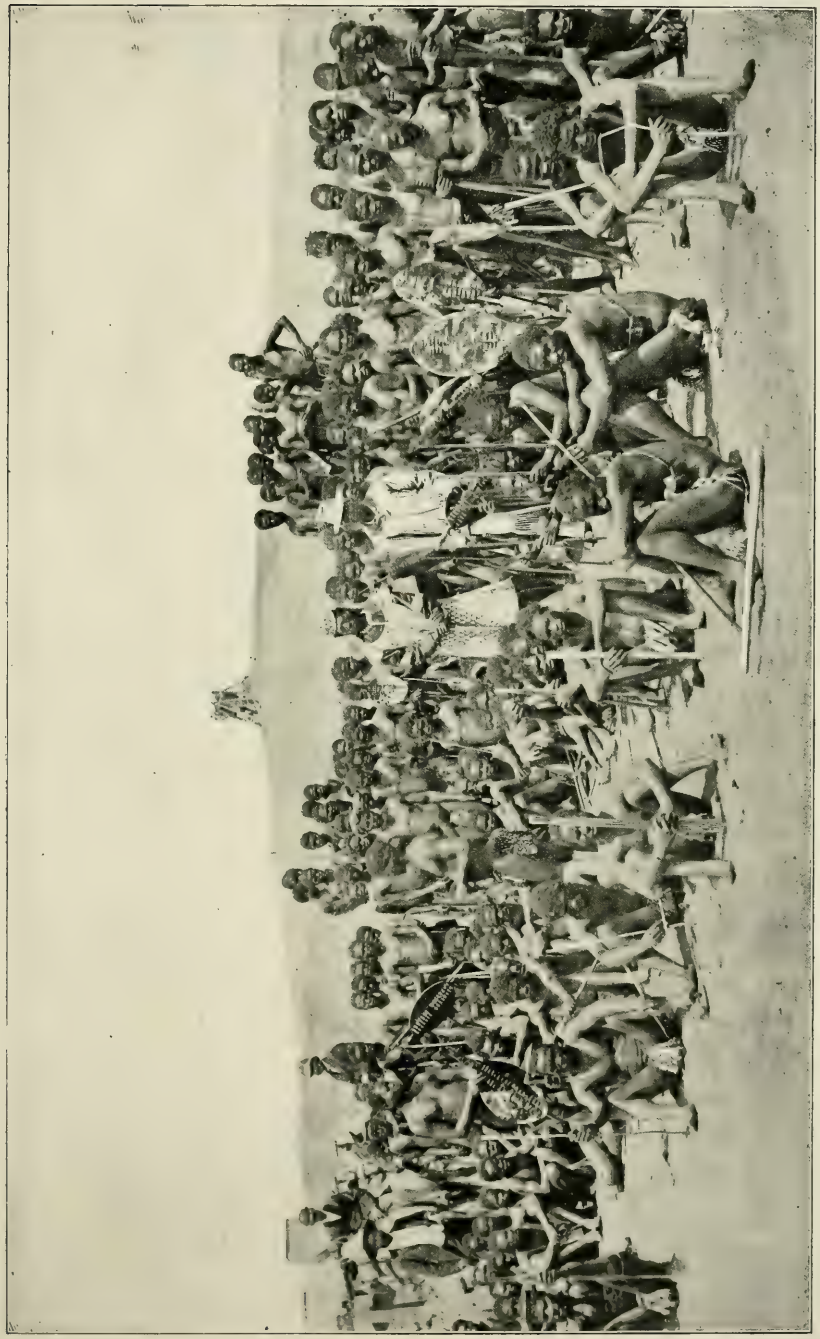
The following article, which is the substance of an address to the National Geographic Society, is largely derived from two handsome volumes by Mr Gardiner F. Williams, "The Diamond Mines of South Africa," a new edition of which has been recently published by B. F. Buck & Co., of New York. In this work Mr Williams gives an interesting account of the Zulus and other South African natives, of the Boers and of their terrible struggle with the Zulus, of the coming of the Englishman, and the discovery, exploitation, and development of the wonderful De Beers mines. The article and pictures are copyrighted by Mr Williams.

NOWHERE else on the face of the earth is there an assemblage of workers of such varied types of race, nationality, and coloring as are to be seen in the South African diamond fields. There is hardly a nation of Europe or colony of the British Empire that has not some representatives. There are adventurers from the United States, Mexico, and South America, and white men from all the colonies of South Africa mingle with the masses of native Africans of every shade of dusky hue shown by the tribes that range from the Cape to the Equator. Even the American Indian is not unknown in the fields, one specimen at least having resided there for many years. Add to this motley throng a sprinkling of dark East Indians, Malays, and Chinese, and the kaleidoscopic shifts and colorings of this babel in the diamond fields may be dimly conceived.

Only about one-sixth of the workers in the mines are whites, and the larger part of these are employed above ground on the floors, in the workshops, and in the offices of the mining companies.

The majority of the white workers above and below ground have their homes in Kimberley and the other neigh-

A Zulu and His Ten Wives



Zulu Workmen of the Diamond Mines

boring mining towns. Wages paid to European day laborers on the surface range from 10s. to 15s. ($2.40 to $3.60) a day; mechanics receive higher pay, which ranges from 16s. 8d. to 1 pound ($4 to $5) per day, and white miners are paid the same rate. Miners who prove their competence are given contracts for specified work, by which their earnings are usually materially increased.

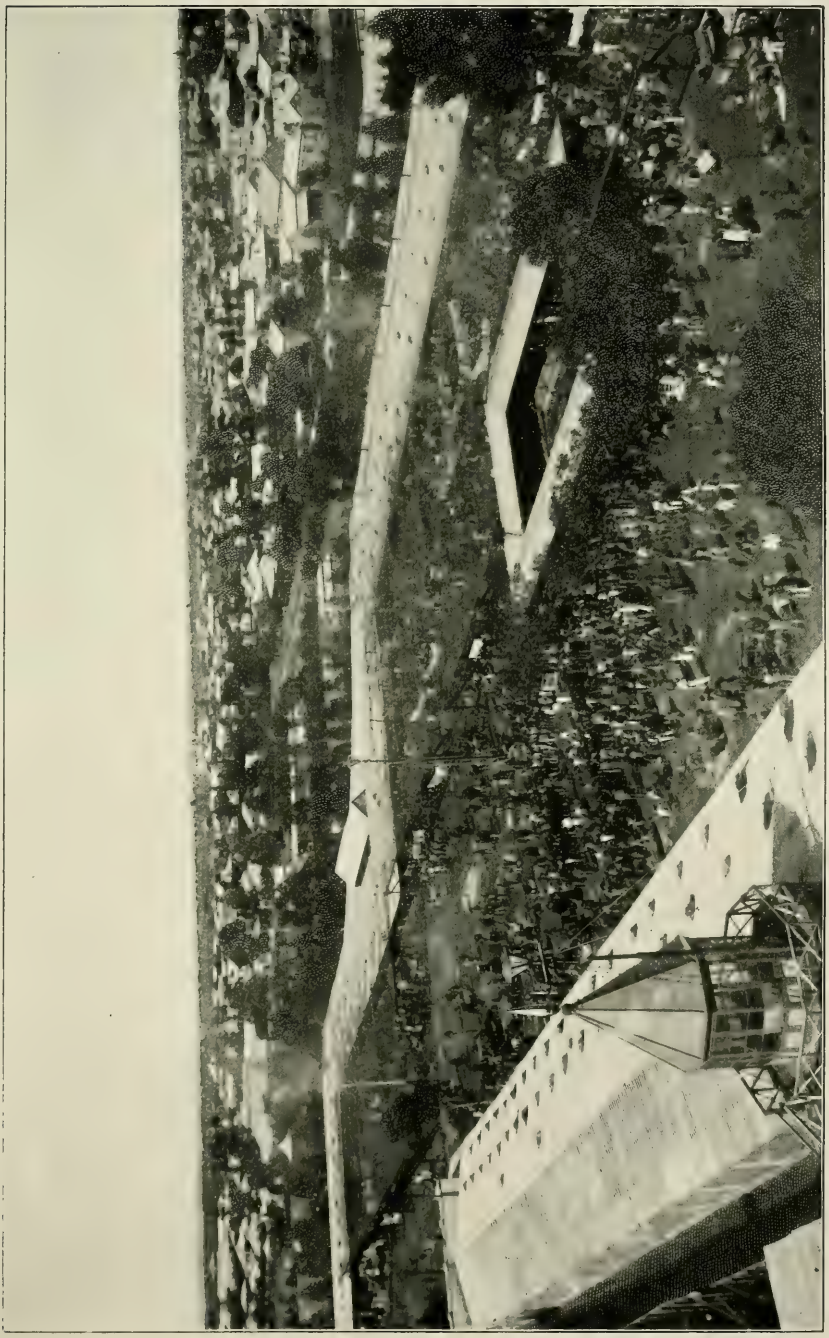
Employees' houses in Kimberley are scattered through the town and many of them own their own homes. Some of the miners' houses cost 500 pounds or over.

In the mines operated by the De Beers Company alone more than eleven thousand African natives are employed below and above ground, coming from the Transvaal, Basutoland, and Bechuanaland, from districts far north of the Limpopo and the Zambesi, and from the Cape Colony on the east and the south to meet the swarms flocking from Delagoa Bay and countries along the coast of the Indian Ocean, while a few cross the continent from Damaraland and Namaqualand and the coast washed by the Atlantic. The larger number are roughly classed as Basutos, Shanganes, M'umbanes, and Zulus, but there are many Batlapins from Bechuanaland, Amafengu, and a sprinkling of nearly every other tribe in South Africa. Many travel hundreds of miles, and some more than a thousand miles, in order to reach the diamond fields, and many of these arrive half starved and so weak and emaciated that they are almost worthless as laborers for weeks afterward. The natives, as a rule, are generally muscular, sinewy men, but not fleshy. Their feet are broad and flat, but their legs and arms are commonly well rounded and their thigh and shoulder muscles are large. The living skeletons who come in from the far interior districts of Africa gain flesh as rapidly when they reach a field flowing with meat and porridge as lean cattle do in green pastures. In the early years of the mines the raw recruits were hooted at and sometimes pelted with stones by their kinsmen at the mines, but of late years this rough greeting and hazing has very largely passed away.

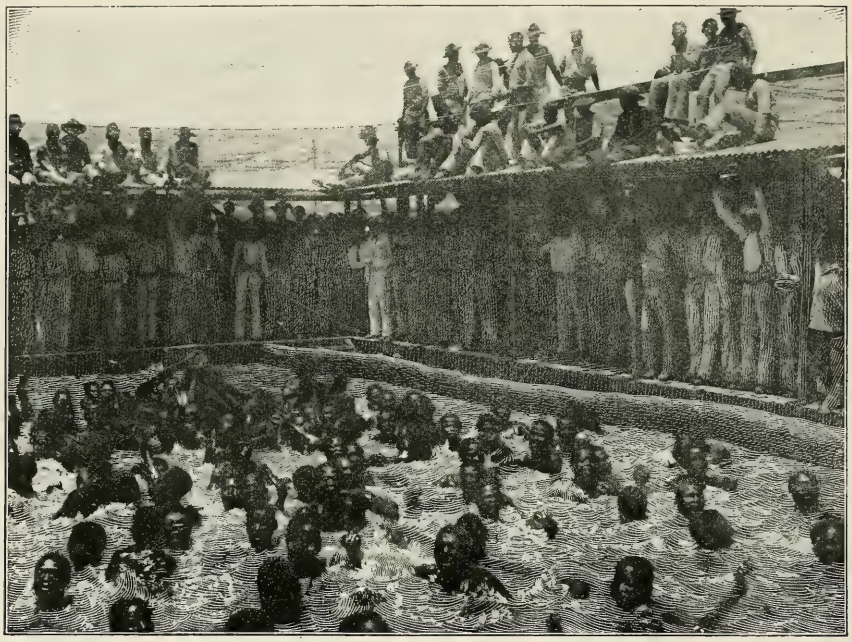
THE DE BEERS COMPOUND

For the lodging and feeding of this great force of native Africans special provision is made by the erection of large walled enclosures, called compounds, at the mines and on depositing floors. There are 17 of these compounds on the diamond fields, twelve of which are owned by the De Beers Company. The largest of all is one at De Beers mine, and the description of this will serve for all, as they are essentially alike except in size.

Fully four acres are enclosed by the walls of the De Beers compound, giving ample space for the housing of its 3,000 inmates, with an open central ground for exercise and sports. The fences are of corrugated iron, rising ten feet above the ground, and there is an open space of ten feet between the fence and the buildings. At the northern end of the compound there is an entrance gate. Iron cabins fringe the inner sides of the enclosure, divided into rooms 25 feet by 30 feet, which are lighted by electricity. In each room 20 to 25 natives are lodged. The beds supplied are ordinary wooden bunks, and the bed clothing is usually composed of blankets which the natives bring with them or buy at the stores in the compound, where there is a supply of articles to meet the simple needs of the natives. Besides these stores there is a hospital and dispensary, where any needed medical attention is promptly given, and a church for religious services, conducted by missionaries delegated by the various church denominations. During week days this church is also used as a school for the instruction of the natives. Compartments with entrances opening through the walls are set apart for latrines and cared for with strict attention to sanitation. In the center of the enclosure there is a large concrete swimming bath, in which most of the natives are at times found diving and swimming, as is vividly shown in the accompanying illustrations. If any fail to show the



De Beers Compound, showing Swimming Bath in Center



Swimming Bath, De Beers Compound

necessary regard to cleanliness they are compelled to keep themselves clean.

A competent manager is in charge of the compound and his assistants are intrusted with the charge of preserving order and enforcing the compound regulations. The natives look upon the manager as their great white chief. He settles any disputes which may arise among them, and in conjunction with the mine manager investigates any complaints in reference to the amount of pay which has been allowed them or any punishment or ill treatment by their white "baases, which, needless to say, is contrary to the regulations.

The compound is lighted by electricity, arc lights being hung within and without the enclosure. When a newcomer or a number of natives, for they usually come in little troops, apply at the gate of the compound for employment, the applicants are admitted into the compound only by the immediate direction of the manager or his assistants. As soon as they enter, their clothes are searched to prevent the smuggling in of liquor, playing cards, or other forbidden articles; then the officer in charge of the dispensary examines each separately and carefully. No diseased man is given work, and any suffering from contagious diseases are sent at once to a quarantine building outside the compound, where a temporary provision for such cases has been made. Within 24 hours a second examination of every one admitted who shows any symptoms of the disease is made by a physician in the employ of the company who daily visits the compound.

To enter the service of the company, each applicant must sign a written contract binding himself to live in the compound and work continuously and faithfully for a period of at least three months or longer if he so desires. At the expiration of a contract the applicant may leave if he chooses or his contract may be renewed indefinitely. Some of the natives in De Beers compound have been employed continuously for ten years or more in the service of the company, for

Zebras

the more industrious prefer the certainty of wholesome food and steady pay to the shifting to any other occupation that is open to them or to return to their old savage life.

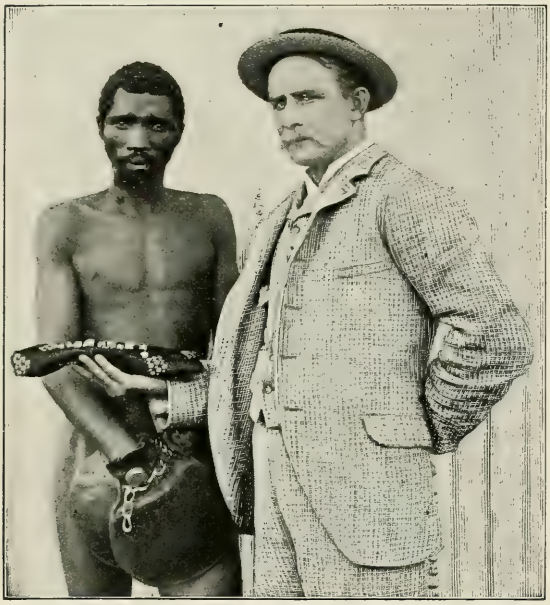
The ordinary dress of the natives in the compound is a woolen shirt, trousers, and shoes. They rarely wear any underclothing, and when at work in the mines a pair of ragged trousers, a blanket, or old breech cloth will often be their only covering. Occasional visitors to the mine are startled by the native disregard for cover; but the natives are commonly alert to pass the word "umfas" (woman) from one to another when a lady visitor is seen in the mines, and then the native workers on the level ahead scramble for cover or hiding.

When any injuries happen to the men from accidents in the mines, the suffering natives show remarkable fortitude in bearing pain and enduring the necessary surgical operations. Their blood is warm and pure, and cuts in their flesh, or bruises, heal very rapidly. They suffer most from diseases of the lungs, especially phthisis and pneumonia, which are common maladies of the native tribes outside of the mines as well as within the compounds. They can readily obtain fresh vegetables and fruit, but the common choice of food, such as mealie meal and meat, exposes them to attacks of scurvy.

ATTEMPTS TO STEAL THE DIAMONDS

No corporal punishment of the natives by white employers is allowed. If a boy is unruly he may be placed in a room by himself until he can be taken to jail and charged with whatever offense he has committed. The most common offense is petty thieving.

There can be no doubt that the covert purloining of diamonds would be a fre-



A Diamond Thief, and the Diamonds which he had Swallowed and which were Recovered by the Guards in the Compound

quent practice and cause heavy losses to the diamond mining companies if it were not for the compound system, which makes it impossible for natives to take any diamonds out of the compounds with them.

A fine wire netting is stretched over the top of the compound to prevent the sly tossing of precious crystals over the walls, to be picked up by confederates outside the mining areas. Precautions are also taken to prevent the smuggling away of diamonds from the compounds, and all communication by the natives with persons outside the walls is carefully restricted. Until the expiration of his contract, no native can go through the compound gate except by special permission or when he is taken under guard before a magistrate for some offense. If convicted, when his term of imprisonment expires or after he has paid his fine he must return to the compound and complete his contract. Before leaving the compound his clothes and person are thoroughly searched to prevent the disappearance of diamonds with them. Gems were sometimes found secreted in clothing, or shoe heels, or canes, or cans with false bottoms—in fact, in anything that the natives were allowed to take out with them. Even this close inspection did not bar the practice of stealing, and there was an inexplicable trickle of diamonds from unlooked-for quarters until it became known that natives on the point of leaving the compound were swallowing diamonds and conveying them away.

In 1895 one native had the nerve and capacity to swallow a lot of diamonds worth 750 pounds, and did not appear to suffer from this strain upon his digestion. There has been only one authentic instance where a native has embedded diamonds in his flesh; this was done by a native in De Beers convict station, who made an incision under the shin bone and concealed several small diamonds wrapped in a rag. This native had symptoms of tetanus, and the visiting physician searched the man's body, and finding an ugly looking wound on his leg, cut it open, and to his great surprise found a rag full of diamonds. The native soon recovered, a wiser, if a poorer, man. There is no apparent fear of swallowing any stone which can be forced through the throat, and in one instance a diamond as big as a large chestnut and weighing 152 carats was hidden for seven days by this means.

The swallowing of a rough diamond is evidently so easy, but so difficult to detect, that it was necessary to put an end to the practice by providing a longer period of detention and search. At the close of their contracts, natives whose terms of service have nearly expired are placed together in a commodious room capable of holding two hundred men or more. They enter this room entirely naked. Their clothes and baggage are deposited in sacks marked in accordance

Miners Going to Work

with the number on the arm band. Blankets are supplied for clothing and as wraps when sleeping. They are fed, and generally well cared for, free of cost to themselves. While in the detention room they are under strict supervision of white guards, so that any diamonds they may have swallowed must be left behind before they leave. Natives have been known to keep diamonds in their bodies for over seven days. At the end of five days of detention, generally on Saturday morning, they are released. Meanwhile the clothes placed in the sacks have been

thoroughly searched, and departing natives are not allowed to take away with them anything but soft goods. In fact, they are even required to leave their boots behind, for cunning smugglers used to insert diamonds in their boot heels so neatly that the trick could not be detected without cutting away the greater part of the sole of the boot. Boots and shoes and other articles which are not allowed to be taken from the compound are sold or given away to customers or friends before their owners leave.

It may be that De Beers compound is a "Monastery of Labor," as was wittily said by a lady visiting the fields as a correspondent of the *London Times,* but the testimony of all careful observers on the ground affirms the beneficial effect of the restrictions from dissipation and the general good cheer of the workers. Mr Thomas H. Leggett, an entirely independent and competent American witness, wrote of his inspection of the men of the compounds: "These chaps are well cared for, contented, and happy, as proven by the fact that many have been there for years; and the secret of it lies in their not being able to get drink."

Traction Engine for Harrowing Blue Ground

WINNING THE DIAMOND

The diamonds exist in a hard blue ground which millions of years ago gushed up from the interior of the earth and filled the throats of volcanoes.

Thousands of tons of this blue ground

are brought up daily from a depth of more than one thousand feet and spread over the floors. These floors are made by removing the bush and grass from fairly level stretches of ground. After clearing the face of the ground it is hardened and smoothed with heavy rollers until it is fit for use.

After the blue ground has been spread out, it is necessary to wait patiently until the sun and rain have contributed their service in disintegrating the breccia. The effect of the exposure of this curious compound to heat and moisture is very remarkable. Large pieces of blue, which are as hard as sandstone when freshly taken from the mine, soon begin to crumble on the depositing floors. To hasten the disintegration, the bed of blue is harrowed several times to turn up the bigger lumps and expose fresh faces of the ground to the sun. Spans of mules were originally used to drag the light harrows used in those days, but steam traction engines are now employed to draw wheeled harrows with huge teeth back and forth across the floors. So the great spread of the floors looks like some vast plowed farm where the laborers are preparing the soil for seed.

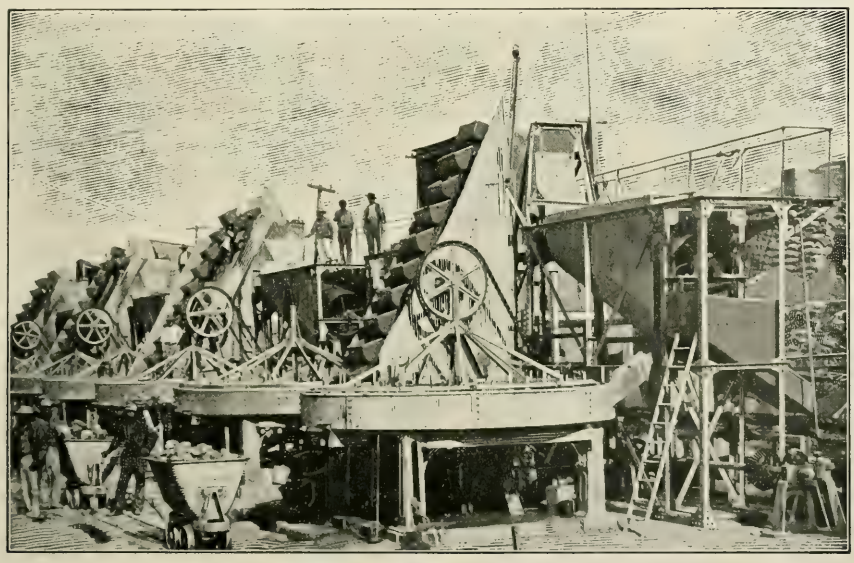
The diamonds are invisible. During the fifteen years of my charge of the De Beers mines I have never found a diamond on the floors.

Under normal conditions soft blue ground becomes sufficiently pulverized in from four to six months, but it is better to expose it for a longer period, even for a whole year.

The ground is then carried in automatic trucks to the washing machines, where it is mixed with water to a very thin mud and passed through a series of pans and screens. Fifty per cent of De Beers ground, when well pulverized, will pass through a screen with holes one-sixteenth of an inch square.

When the day's work is completed, the pans, through each of which three hundred loads have passed, are emptied or "cleaned up," and the concentrated deposits of diamonds, mingled with other heavy but valueless minerals, are then sent to the pulsator, which separates the diamonds sufficiently for the sorting tables.

The work of picking out the diamonds by hand from the concentrate on the sorting tables was, of course, necessarily slow and tedious. It was the only divis-

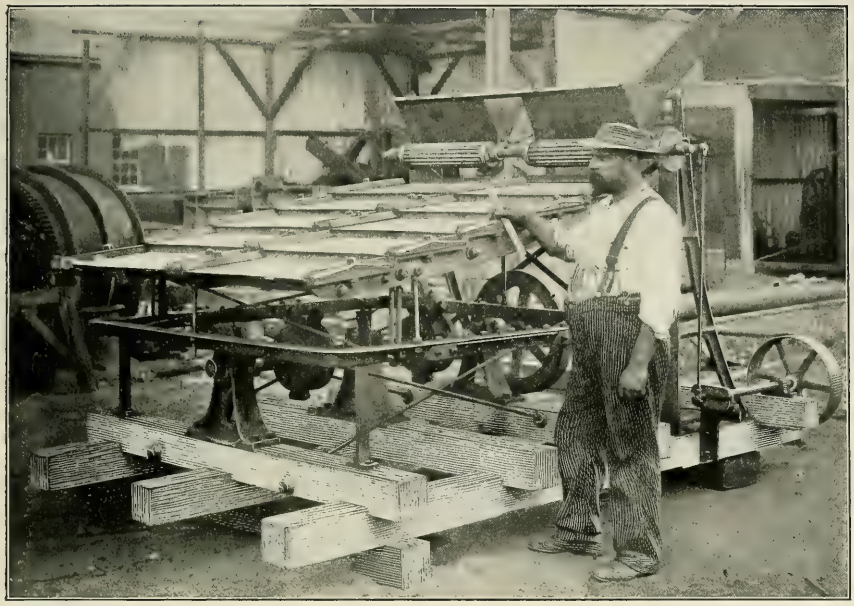


Washing Machine

The Old Method of Separating the Diamonds—Picking them out of the gravel by hand.

ion of diamond mining and winning which seemed beyond the application of blind and unconscious machinery. But men today are not inclined to admit that anything greatly worth doing is impossible.

A series of experiments was initiated by me with the object of separating the diamonds from the heavy valueless concentrates with which they are associated. An ordinary shaking or percussion table was constructed, and every known means of separation was tried without success. One of the employees of De Beers, Mr Fred Kirsten, was in charge of the experimenting, under the supervision of the late Mr George Labram, the manager of the large crushing plant and afterward mechanical engineer to the company. Notwithstanding the fact that the specific gravity of the diamond (3.52) was less than that of several of the minerals associated with it, so that its separation would seem a simple matter, it was found in practice to be impossible, owing to the slippery nature of the diamond. The heavy concentrates carried diamonds, and diamonds flowed away from the percussion tables with the tailings. When it seemed that every resource to do away with the head sorting had been exhausted, Kirsten asked to be allowed to try to catch the diamonds by placing a coat of thick grease on the surface of the percussion table with which the other experiments had been made. Kirsten had noticed that oily substances, such as axle grease and white or red lead, adhered to diamonds when they chanced to come into contact, and he argued to himself, if these substances adhered to diamonds and not to the other minerals in the concentrates, why should not diamonds adhere to grease on the table, and other minerals flow away? In this way the remarkable discovery was made that diamonds alone of all minerals contained in the blue ground will adhere to grease, and that all others flow away as tailings over the end of the percussion table with



Automatic Diamond Sorter, called the Greaser, the new method of separating the diamonds. See text below

the water. After this was determined by thorough experiments, more suitable shaking tables were constructed at the company's workshops. These were from time to time improved upon, until now all the sorting (except for the very coarse size) is done by these machines, whose power of distinction is far superior to the keenest eye of the native. Since the discovery of the affinity of grease for diamonds, experiments have been made with rubies and sapphires from Burma, and it was found that grease caught these gems with the same certainty that it catches diamonds.

After a thorough trial a number of these unique diamond-catching tables (see picture) were constructed and are now working on De Beers concentrates. Each shaking table is made of corrugated cast-iron plates in five sections, with a drop of about an inch from one division to another. Thick grease is spread on the plates to cover them to the top of the corrugations.

Strange to relate, the descending diamonds stick on the face of the grease, while all other minerals pass over it. Only about one-third of 1 per cent of diamonds is lost by the first table, and these are recovered almost to a stone when the concentrates are passed over the second table. The discrimination of this sorter is surely marvelous. Native workers, although experienced in the handling of diamonds, often pick out small crystals of zircon, or Dutch boart, by mistake; but the senseless machine is practically unerring. It will catch rubies, sapphires, and emeralds as well as diamonds; but, so far as it has been tested, it will not cling to anything but a precious stone. The grease which is used loses its power to catch diamonds after a few hours' work, owing to its becoming more or less mixed with particles of water. It is then scraped off the tables, together with the diamonds adhering to it, placed in a kettle made of finely perforated steel plates, and steamed. The grease passes away to tanks of water, where it is cooled and is again fit for use.

Formerly, of 12,000 loads, which is about the daily average of the quantity washed at De Beers and Kimberley mines, 160 cubic feet had to be assorted by hand.

When the stones are cleaned they are carefully assorted with reference to size, color, and purity and made up in parcels for sale. For several years past the De Beers Company has sold in advance its annual production to a syndicate of London diamond merchants who have representatives residing in Kimberley.

When the bare statement is made that nearly five million truck-loads, or more than four million tons, of blue ground have been washed in a year, the mind only faintly conceives the prodigious size of the mass that is annually drawn from the old craters and laboriously washed and sorted for the sake of a few bucketfuls of diamonds. It would form a cube of more than 430 feet, or a block larger than any cathedral in the world, and overtopping the spire of Saint Paul's, while a box with sides measuring two feet nine inches would hold the gems.

Diamonds are so highly prized and so imperishable that the amount of these gems in existence may almost be reckoned as the total of the world's production, ranging in value through hundreds of millions of dollars. Mr Kunz does not estimate a loss of 5 per cent in a hundred years, and the South African diamond fields alone have contributed over $400,000,000 in value to the world's stock. Yet the demand increases apace with the world's growth in wealth, and no diversion of the world's fancy is apparent.

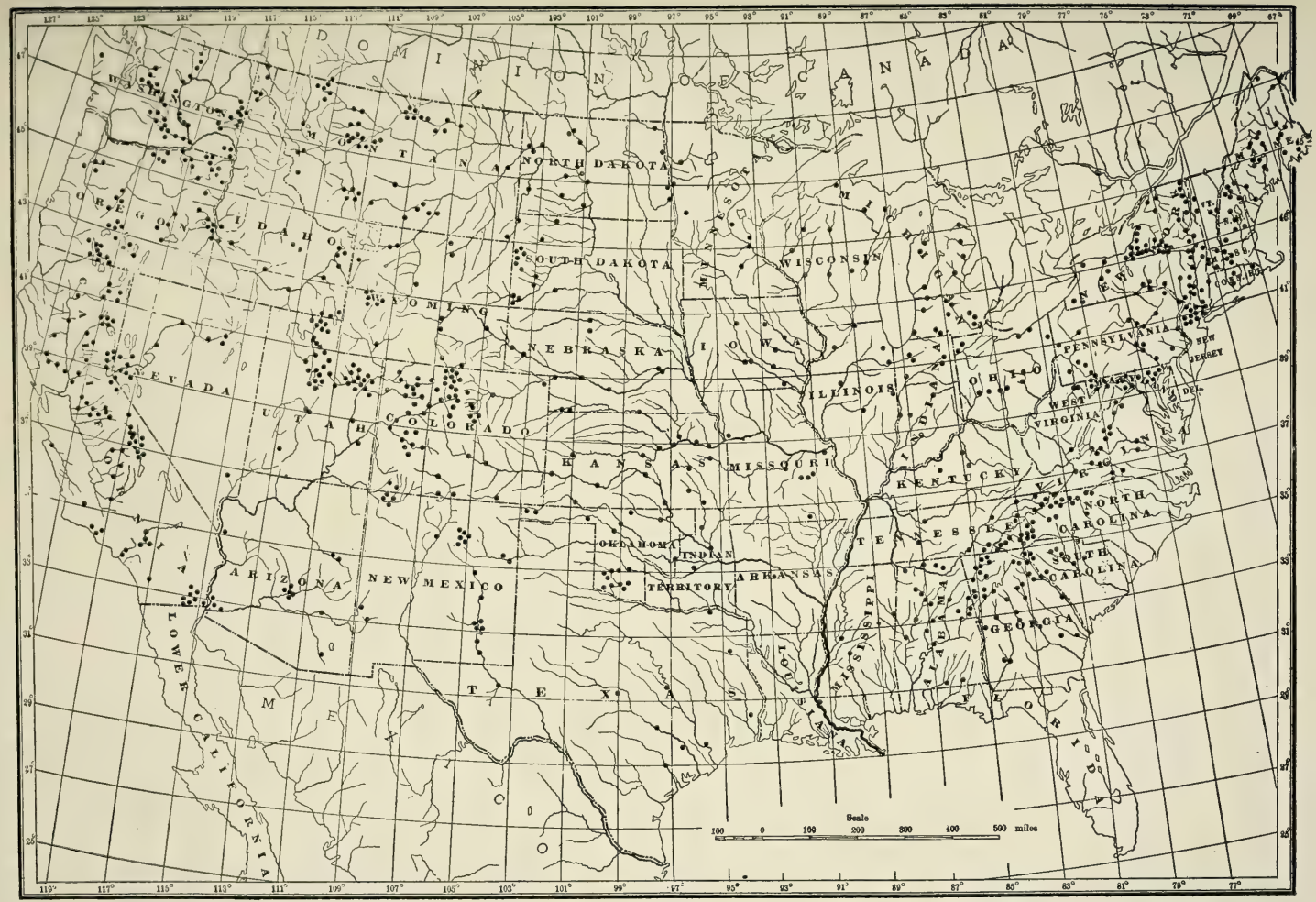
CANADIAN IMMIGRATION

THE Canadian Commissioner of Emigration in London, Mr W. T. R. Preston, talking on the successful efforts of the Canadian government to induce emigration to that country from Great Britain, said:

"Five years ago Canada was receiving 12½ per cent of the total of from 60,000 to 70,000 emigrants from Great Britain to North America. Now she receives over 50 per cent. In these five years the immigrants into Canada from Great Britain have increased from 8,000 annually to 65,000. Canada wants population. A net bonus of $1.75 per head is given by the government to every emigration agent in Great Britain sending out emigrants to settle the land. Each British agricultural emigrant averages a total cost of $13 to the Canadian government, and each continental emigrant costs the sum of $5. Consequently the Canadian government is paying $8 per head more for British than for continental emigrants."

The Colonizer of London publishes an interview with a firm in that city which makes it its business to send children to Canada. The head of the firm stated that for $125 they would send a boy, pay his fare, and take care of him until he has settled with some farmer. The boy is paid from $5 to $12 per month by the farmer.

The payments by the Canadian government to the emigration agents in Europe for each emigrant sent to Canada accounts for the large increase of emigration to that country in recent years.



From F. H. Newell, Chief Engineer

Map showing the Location of the Principal River Stations maintained in the United States by the U. S. Geological Survey

The object is to find out the amount of water available in our rivers for irrigation, manufacturing, and commercial purposes

PHOTOGRAPHS OF WILD GAME

THE July number of this Magazine will contain an article by Hon. George Shiras, 3d, entitled "Photographing Wild Game with Flashlight and Camera." It will be accompanied by more than 60 pictures, most of them full-page illustrations, of deer, bull moose, raccoon, wild cat, porcupine, pelican, blue heron, white heron, gulls, ducks, kingfisher, woodpecker, etc., taken by Mr Shiras during his camera hunting trips of the last fifteen years.

THE LURAY CAVERNS

THE Luray Caverns were visited by about 450 members of the National Geographic Society on May 19, and again on May 26 by about 250 more members, for whom accommodations could not be provided on the first excursion. Each party left Washington at 8 a. m. on a special vestibule train provided by the Baltimore and Ohio Railroad. The members were shown through the caverns in squads of 25 each, accompanied by intelligent guides. It is practically the unanimous opinion of all that in beauty and splendor the Luray Caverns equal, if they do not surpass, the most extravagant descriptions that have been written about them. The formations vary as much in beauty and weird design as the frost on a New England window pane varies from day to day in winter. The cave covers an area of 10 acres. Its lowest point is 166 feet below the surface.

The Caverns of Luray are situated about 120 miles from Washington, in the famous Shenandoah Valley, in a region renowned for the picturesqueness of its scenery and celebrated for its historical associations.

The caves were discovered in 1878, and shortly thereafter were opened to the public. The full extent of their subterranean depths was not then known, or even suspected, and not until thoroughly equipped exploring parties had penetrated seemingly endless chambers and labyrinthine passages were their boundless riches disclosed and made accessible to visitors. Since that time the fame of the caverns has penetrated the uttermost parts of the earth, resulting in the visits of many thousands each year. Persons from all quarters of the globe—scientists, explorers, and tourists—have wandered through the wonderful chambers, and the general verdict of their united testimony is that Luray Caverns excel all others in the combined extent, variety, scientific interest, and beauty of their calcite formations. Comparing this great natural curiosity with others of the same class, it is safe to say that there is probably no other cave in the world more completely and profusely decorated with stalactitic and stalagmitic ornamentation than that of Luray.

Every facility for visiting all the chambers and seeing all the wonders in the most comfortable manner has been provided. Cement walks have been laid, stairways, bridges, and iron railings have been erected where such help was necessary, and the entire subterranean palace is illuminated by both arc and incandescent electric lights. The interior is singularly free from dampness or dripping water, and no special preparation for the visit is needed in the matter of clothing. Plain clothing and stout shoes comprise the necessary outfit, wraps being superfluous, as the temperature remains, winter and summer, at about 54 degrees.

Dr H. C. Hovey, a member of the National Geographic Society, in the Encyclopedia Britannica, writes of the cave as follows:

"The stalactite display exceeds that of any other cavern known, and there is hardly a square yard on the walls or ceiling that is not thus ornamented. The old material is yellow, brown, or red, and its wavy surface often shows layers like the gnarled grain of costly woods. The new stalactites growing from the old, and made of hard carbonates that had already once been used, are usually white as snow, though often pink, blue, or amber-colored. The size attained by single specimens is surprising. The Empress Column is a stalagmite 35 feet high, rose-

Copyright, 1906, by J. D. Strickler

The Approach to Saracen's Tent

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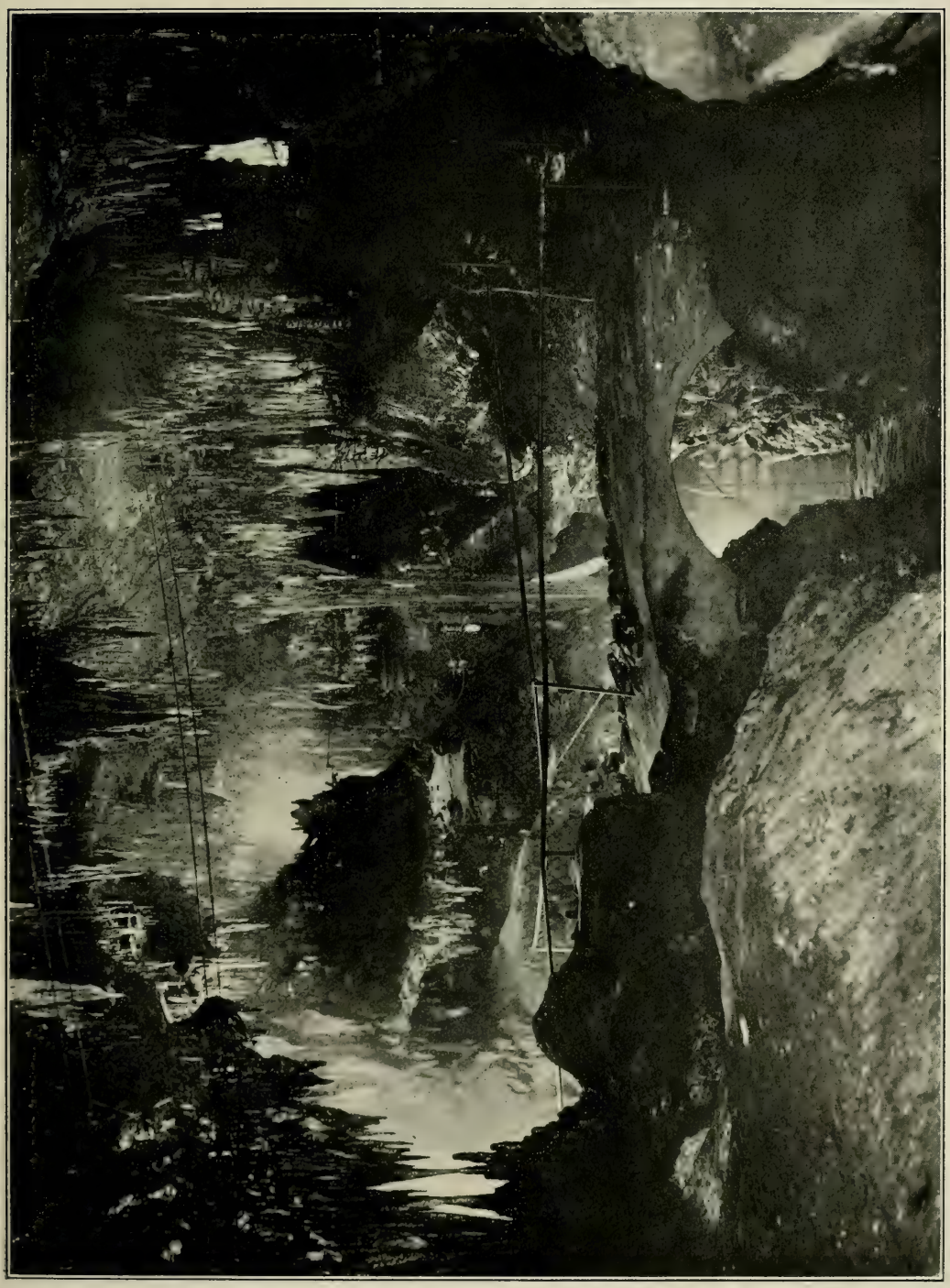
The Organ and Chimes in the Cathedral. The chimes are sweet and clear as silver bells



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Stalactites in Luray Cave

colored, and elaborately draped. In the canopy above the Imperial Spring it is estimated that 40,000 are visible at once.

"The 'cascades' are wonderful formations, like foaming cataracts caught in mid-air and transformed into milk-white or amber alabaster. The Chalcedony Cascade displays a variety of colors. Brand's Cascade, which is the finest of all, being 40 feet high and 30 feet wide, is unsullied and wax-like white, each ripple and braided rill seeming to have been polished.

"The Swords of the Titans are monstrous blades, eight in number, 50 feet long, 3 to 8 feet wide, hollow, 1 to 2 feet thick, but drawn down to an extremely thin edge, and filling the cavern with tones like tolling bells when struck heavily by the hand. Their origin, and also that of certain so-called scarfs and blankets exhibited, is from carbonates deposited by water trickling down a sloping and corrugated surface. Sixteen of these alabaster scarfs hang side by side in Hovey's Balcony, three white and fine as crepe shawls, thirteen striated like agate with every shade of brown, and all perfectly translucent. Down the edge of each a tiny rill glistens like silver, and this is the ever-plying shuttle that weaves the fairy fabric.

"The waters of this cavern appear to be entirely destitute of life, and the existing fauna is quite meager, comprising only a few bats, rats, mice, spiders, flies, and small centipedes. When the cave was first entered the floor was covered with thousands of tracks of raccoons, wolves, and bears—most of them probably made long ago, as impressions made in the tenacious clay that composed most of the cavern floor would remain unchanged for centuries. Layers of excrementitious matter appear, and also many small bones, along with a few large ones, all of existing species. The traces of human occupation as yet discovered are pieces of charcoal, flints, moccasin tracks, and a single skeleton imbedded in a stalagmite in one of the chasms, estimated to have lain where found for not more than five hundred years, judging from the present rate of stalagmite growth." (The members were shown the skeleton pieces, but it must be confessed that a vivid imagination was necessary to see the resemblance to a human skeleton.)

"Geologically considered, the Luray Cavern does not date beyond the Tertiary period, though carved from the Silurian limestone. At some period long subsequent to its original excavation, and after many large stalactites had grown, it was completely filled with glacial mud charged with acid, whereby the dripstone was eroded into singularly grotesque shapes. After the mud had been mostly removed by flowing water, these eroded forms remained amid the new growths. To this contrast may be ascribed some of the most striking scenes in the cave."

NOTES ON THE PANAMA CANAL*

I BELIEVE there are but few who appreciate the tremendous possibilities which the opening of the Panama Canal means to all our country, and especially to the Southern States. As an evidence of how some men regard it, I will quote a remark made in my presence by one of the so-called captains of industry in this country—one of the men who have been most instrumental in the internal development of this nation, one of the men who have made our wonderful prosperity possible, one of the men who control the greatest corporation in the South. In speaking of his holdings in the Tennessee Coal and Iron Company, he said: "When the Panama Canal is completed, every share of my stock in that company will be worth a thousand dollars." He said the opening of that canal will make Birmingham the Pittsburg of the South, and will give it the same relationship to the Gulf that Pittsburg now has to the Atlantic coast. He said the immensity of traffic which originates within 40 miles of Pittsburg, and which is the marvel of the world, will be duplicated in the

*From an address by Hon. Theodore P. Shonts, Chairman Isthmian Commission, to the Chamber of Commerce, Atlanta, Georgia, May 30, 1906.

same territory surrounding the city of Birmingham. He said that when he acquired his large interest in this property he did so because of his abiding faith in the development of the South and because of his confidence in the astonishing growth which would take place there upon the opening of the Panama Canal.

WHY THE COMMISSION RECOMMENDS THE LOCK CANAL

The present Commission believes that the type of canal the people of this country want is the one which will provide adequate and safe passage for the largest vessels on the seas, and which can be constructed in the quickest time and at the least cost. The Commission's recommendation, in other words, has been based on the idea that what the people want is the near-by practical rather than the remote ideal. It has therefore recommended the construction of an 85-foot level lock canal for the reasons that, first, in its judgment, it can be completed for about half the cost and in half the time of the so-called sea-level canal; second, because it will be adequate for all the commerce which can reasonably be expected to seek that route during the next 150 years; third, because if the tonnage should increase beyond such expectation, it can be enlarged more cheaply and more quickly than the so-called sea-level canal; fourth, because, from the operating point of view, large ships can be put through more safely and more quickly than through the sea-level; fifth, because when the interest on the difference in cost of construction is added to the cost of operating, the saving to the government every year will be $2,340,000.

The so-called sea-level canal is a deep, narrow, tortuous gorge, which large ships cannot navigate, even according to the estimate of the men who recommend that type of canal, at a greater speed than four miles an hour, and which will contain at times, according to the same authority, a current in one direction of two and six-tenths miles an hour. I venture to say that no large ship, occupying, as large ships will, 40 per cent of the prism through which it will pass, can navigate at that speed, with that current, safely, under its own steam.

The lock canal, on the other hand, as recommended by the minority of the consulting board and indorsed by our Commission, will have 35 miles of free-lake navigation, so that the difference in time of putting large ships through the locks will be more than offset by their speed through the lake portion of their trip, which is more than two-thirds of the entire length of the canal.

In regard to the capacity, no man can estimate with any degree of accuracy the volume of tonnage which will go through the Panama Canal. The only guide we can have is the traffic of the Suez Canal. Taking the development of the traffic in the Suez during the 35 years of its existence as a basis and continuing the same ratio of increase until the year 2000, the volume of traffic passing through that canal will be in that year, in round numbers, 42,500,000 tons; or, estimating that the Panama Canal, if constructed on the plans which this Commission has recommended, will be open for traffic in 1916, and estimating that the volume of traffic passing through it the first year will amount to 5,000,000 tons (which is the best guess that experts have been able to make), and applying the same ratio of increase to that traffic which experience has shown to have developed in the Suez, the volume in the year 2000 will have reached 32,500,000 tons. The estimated capacity of the lock canal, as recommended by our Commission, is 50,000,000 tons per annum. Unless the development of the population of the world changes the basis of our estimates, the type of canal we recommend will be adequate for all business that may be thrown upon it during the next 150 years.

By simply raising the sides of our spillways and increasing the depth of our locks, we can increase the depth of water in the canal so as to take care of still larger vessels than the 40-foot ships provided for in our present estimate, whereas in a sea-level canal you would have to excavate the whole distance for every foot of increase made in depth.

NOTICE TO MEMBERS

In order that their copies of the Magazine may not be lost during the summer, members are requested to advise the office of the National Geographic Society, Hubbard Memorial Hall, Washington, D. C., when they will be absent for a month or more and their residence closed, and at the same time to give their change of address. Magazines are mailed as second-class matter and the post-office will not forward mail of this character unless the additional postage is prepaid.

WASHINGTON, D. C., *May 30, 1906.*

Editors National Geographic Magazine:

Can you tell me the origin and meaning of the word "Labrador?"

I notice from a map published about 1740 that the term was then applied to a body of water in Cape Breton Island, Nova Scotia, now known as the Bras d'Or Lakes, and that the body of land now known as Labrador was then called Terra Labrador.

The northern entrance to the Bras d'Or Lakes, a long narrow passage forming an arm of the sea, was termed during the French occupation "Le Bras d'Or," the arm of gold. Was this a French corruption of the earlier name "Labrador?" The French name still persists as "The Bras d'Or," often locally pronounced "brass door."

The captain of a Cape Breton tugboat thought that it was so named because it was the "door" or entrance to the lakes, but why it should be called the "brass" door he could not possibly imagine! H. A. LARGELAMB.

The region which is called Labrador was so named by the Portuguese navigator Gaspar Cortereal, who landed on the coast about 1500. He called the region "Labrador" because it was thought that the natives would make excellent workers or slaves. Cortereal made several voyages to the coast, 1500 and 1501, landing at points between Labrador and the Bay of Fundy, but from his last voyage he did not return. His brother Miguel, who sailed in search of him in 1502, was likewise lost.

Labrador had been previously discovered by John Cabot in 1497, but as he failed to name the region, the name applied by Cortereal, "Terra de Lavradores" (land of laborers or slaves), clung to it.

The above is the usual explanation of the origin of the word Labrador. Another tradition is that a Basque whaler, called "Labrador," penetrated as far as Labrador Bay (now Bradore Bay), and that as this bay was later much frequented by Basque fishermen, the name was extended to the whole coast.

It is generally believed that Bras d'Or is a corruption from the Indian and not of French origin. The similarity of Bras d'Or and Labrador is very striking, however, and it may be that both words have the same origin.

Hydrology of the State of New York. Compiled by George W. Rafter. Pp. 900. 9 x 6 inches. Illustrated. Published by the New York State Education Department, Albany, 1905. $1.50.

The report on the water supply of New York State gives in detail the statistics and surveys of the Hudson, Genesee, Oswego, and Black rivers as well as of every other waterway in the state worthy of consideration, the volume bringing to the public a realization of the importance of water as an economic mineral, to which New York State owes much of its vast wealth. Papers on ship-canal projects and their water supply, the future use of water power in the state, with tables of the maximum and minimum flow of streams, are also given and statistical comparisons of catchments and sources of supply. The volume is well illustrated and contains two detached maps showing surface configurations and catchments, with reservations for New York city water supply.

J. O. L.

"The New Brazil." By Marie Robinson Wright. Pp. 450. 9½ x 12½ inches. With many illustrations. Philadelphia: George Barrie & Son.

The view of Brazil presented by this volume is that of a land of promise. Wonderful progress has been made during the past ten years, and with further development of her natural resources Brazil has the prospect of a prosperity for the twentieth century which may equal that achieved by the United States during the last hundred years.

The Amazon forests supply the world with rubber, and Brazil sends abroad the major portion of the coffee consumed; Brazilian soil is of such wonderful fertility that it responds to the least cultivation; the mines yield quantities of gold, silver, copper, and precious stones; the transportation facilities are greater than those of any other South American country, and the population is increasing at the rate of seventeen million to the century.

The closing chapters on national customs and characteristics tell of the life of the cultured families of Brazil and of the primitive Indian of the Amazon. F. M. A.

"The Discoverers and Explorers of America." By Charles Morris. Lippincott. 1906. $1.25.

An excellent book for youth as well as for adults. Its 344 pages contain forty narratives of discovery and exploration of the continent, islands and waters of America. The whole story of the gradual opening of a new world is told, from the landing of Lief the Lucky, in the summer season of the year 1000, to the navigation of the Northwest passage by Amundsen, the Norwegian, in 1905.

F. M. A.

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The NATIONAL GEOGRAPHIC MAGAZINE

Vol. XVII JULY, 1906 No. 7

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"Photographing Wild Game with Flash-light and Camera"

By Hon. GEORGE SHIRAS, Third
Member of Congress 1903-1905

With a Series of 70 Illustrations of Wild Game—Deer, Elk, Bull Moose, Raccoon, Porcupine, Wild Cat, Herons, Ducks, Snowy Owl, Pelicans, Birds in Flight, etc.

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Flashlight. Wild Cat or Lynx?

Loon Lake, 125 miles north of Georgian Bay, Canada

VOL. XVII, No. 7 WASHINGTON JULY, 1906

THE NATIONAL GEOGRAPHIC MAGAZINE

PHOTOGRAPHING WILD GAME WITH FLASH-LIGHT AND CAMERA*

Copyrighted, 1906, by George Shiras, 3rd

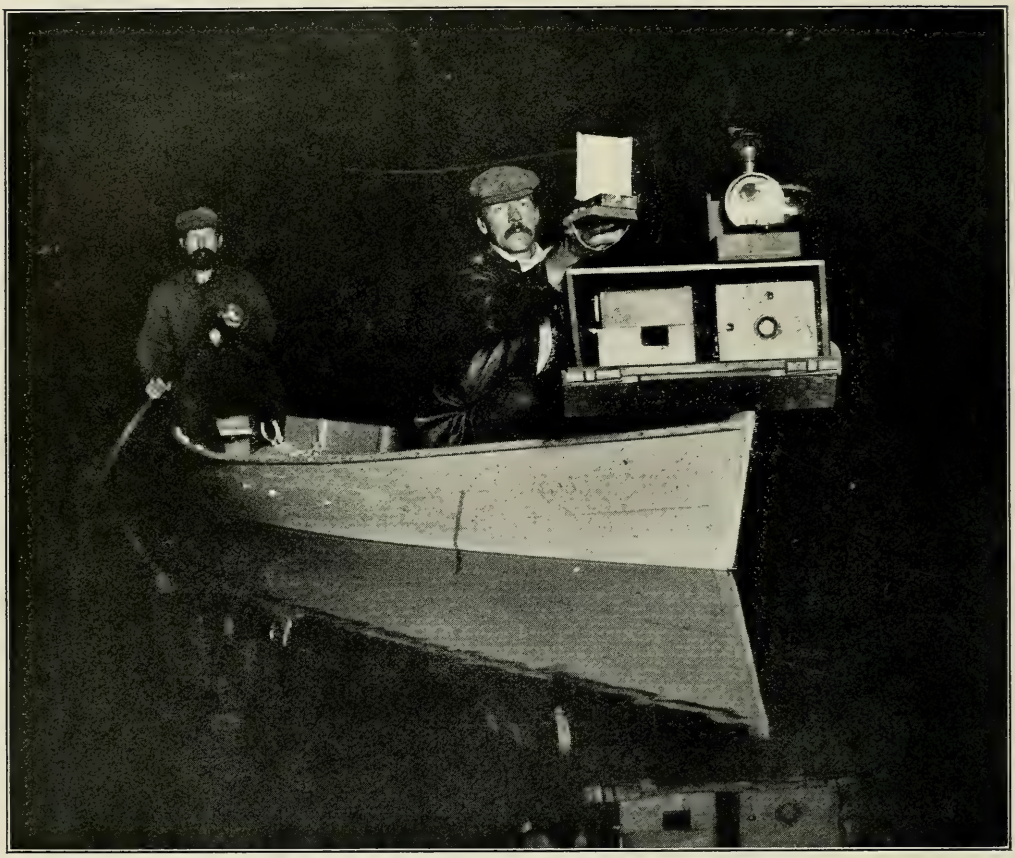
BY HON. GEORGE SHIRAS, 3RD

MEMBER OF CONGRESS, 1903–1905

Mr Shiras was the originator of the sport of hunting wild game with the camera, and for twenty years has devoted his vacations to this fascinating recreation. The methods and implements which he invented have been adopted throughout the world, and have greatly simplified and popularized this branch of photography and sport. Mr Shiras has made it a point never to photograph animals in parks or reservations, all of his shooting being directed against game in the strictest sense wild. The pictures printed in this number were all taken by him, and it is the first time that he has permitted their publication. Several of the flash-lights, those on pages 376, 377, 378, 379, 382, 383, 384, 385, 386, and 387, were exhibited at the Paris Exposition in 1900, where they received a gold medal, and they were again exhibited at St Louis in 1904, receiving a Grand Prize. The reader of this article must admit that no line of sport requires greater patience, perseverance and skill, or is rewarded with such rich and lasting trophies. The game which Mr. Shiras has bagged during these twenty years, he shares with many thousands the world over.

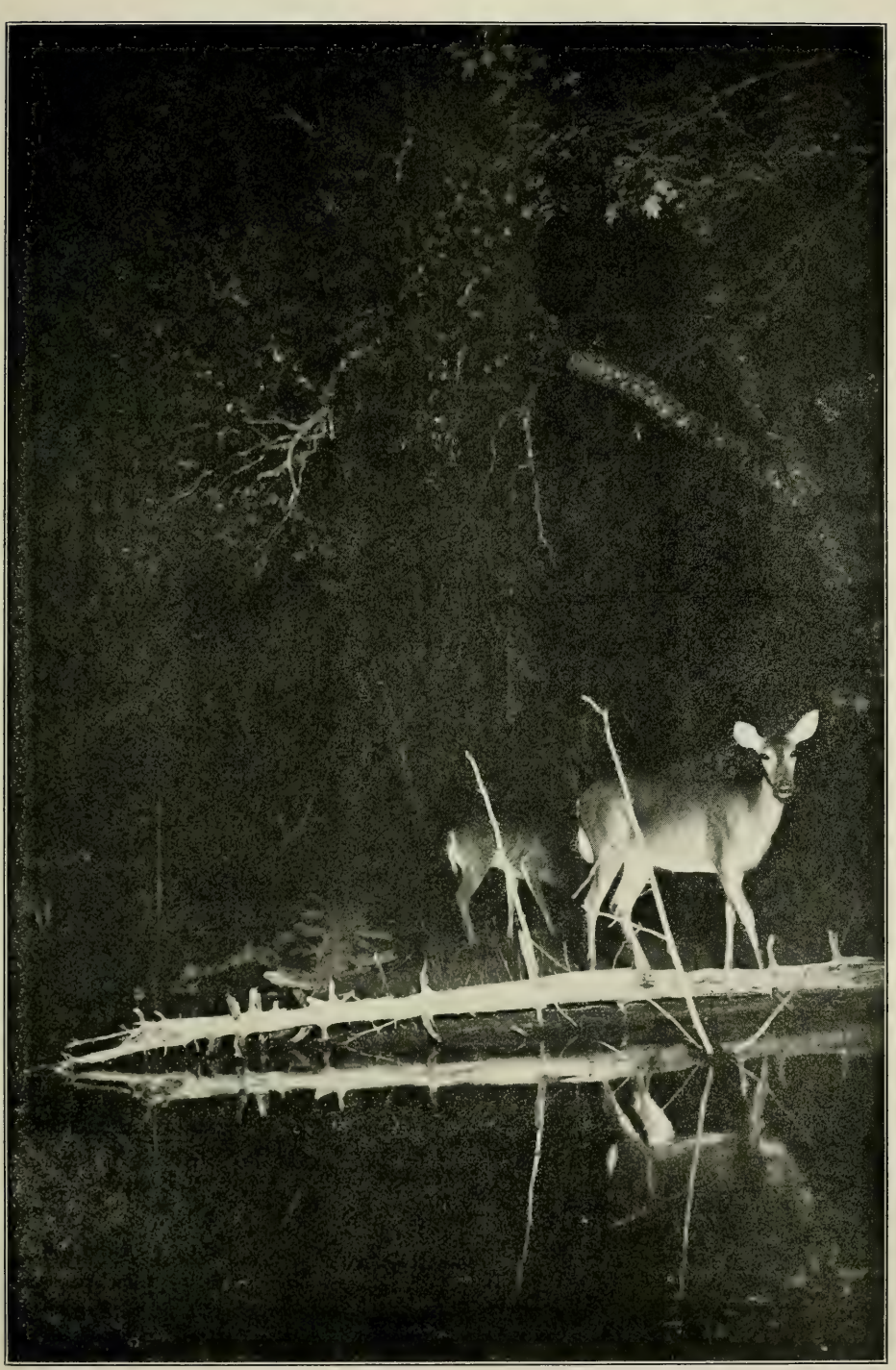
LOOKING back to that period, many years ago, when the finger eagerly pulled the trigger and the eye anxiously sought to pierce the momentary veil of smoke between the gun and its intended victim, and then to that later period, when the simple pressing of a button captured, for all time, the graceful image of the hunted quarry, one becomes conscious of a peculiar mental evolution. Success in the hunting field should properly be dominated by a keen sense of pleasure which, if absent or but a minor incident in the chase, indicates a misdirected effort. We all know, today, that the average successful and contented sportsman will admit that the mere taking of animal life is regarded as an apparently unavoidable incident in the gratification of desires existing wholly apart from the shedding of blood. One purpose of this article is to show that the time has come when it is not necessary to convert the wilderness into an untenanted and silent waste in order to enjoy the sport of successfully hunting wild birds

*An address to the National Geographic Society, April 6, 1906.

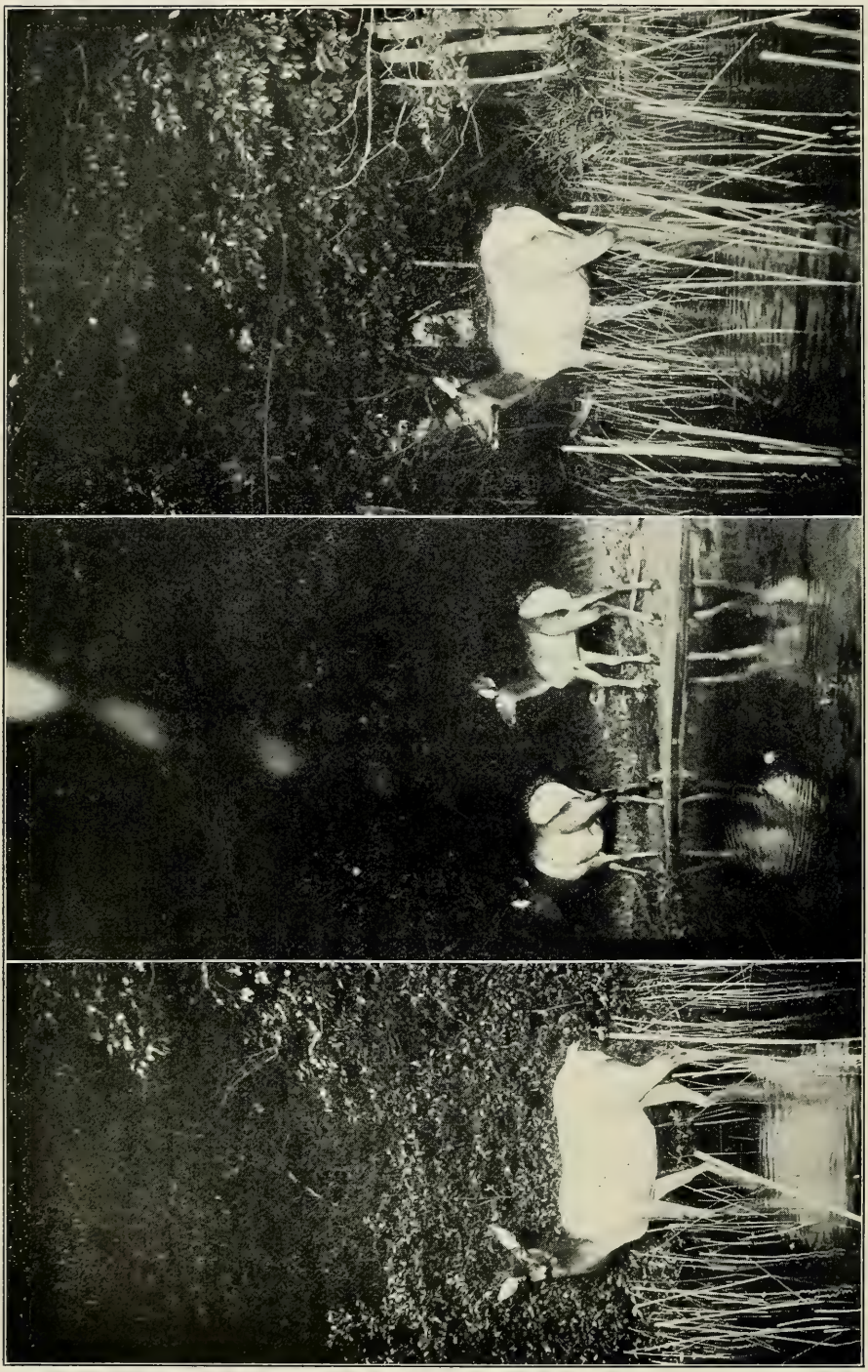


Flashlight. Boat Rigged for Night-hunting with Cameras, showing Flashlight Apparatus and Jack Lamp

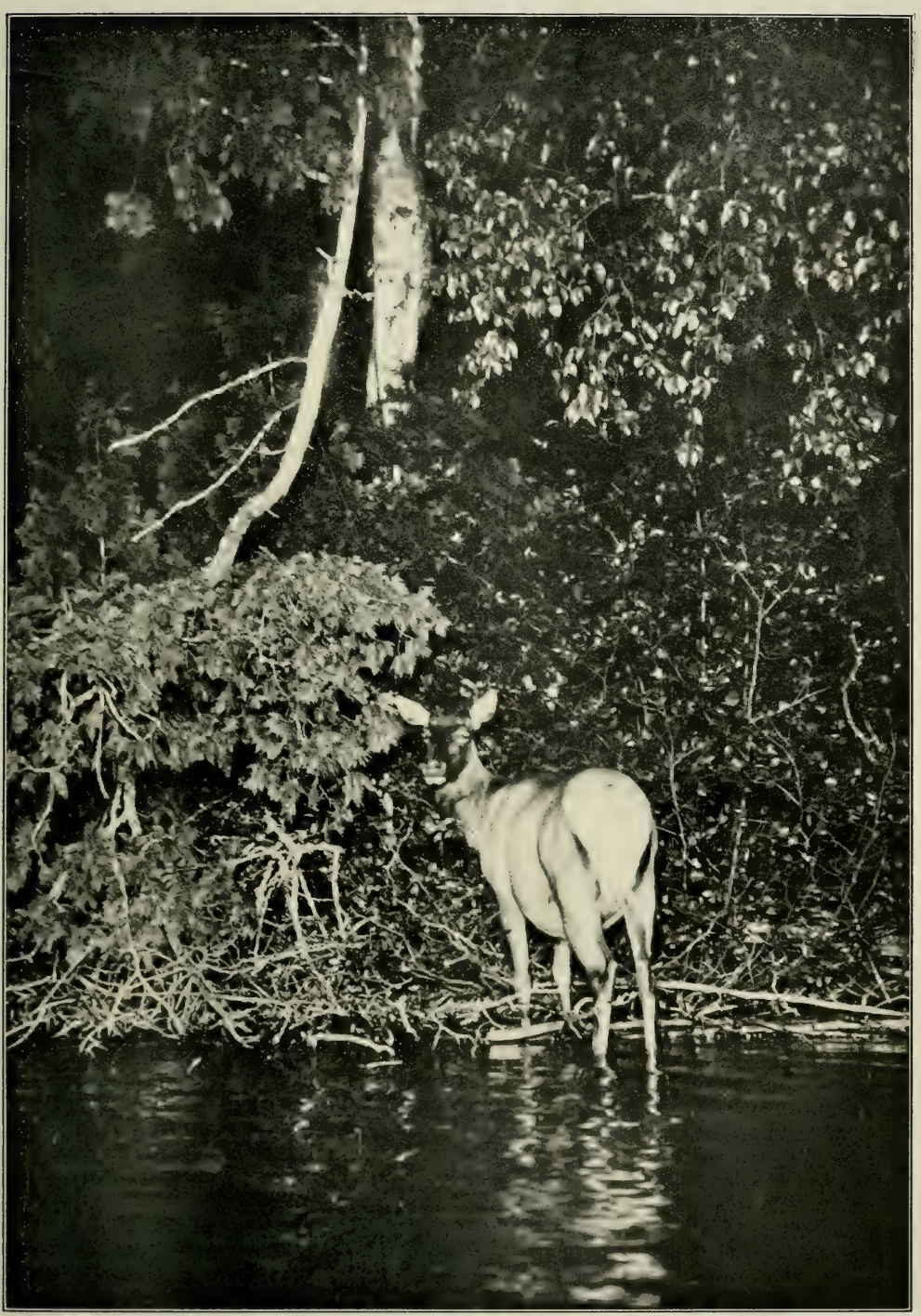
and animals. So many advocates of hunting with the camera have been heard of late, that my voice need no longer be raised in behalf of this sensible and attractive pastime, were it not that the majority of such writers, coming from the ranks of the naturalist and the amateur photographer, almost invariably decry the sportsmen as a set of ruthless butchers, blind alike to the beauty of wild life and to the ethics of ordinary decency. No greater error could exist or its effects be more unfortunate. Sportsmen, the world over, constitute a high order of citizenship; generous, self-reliant, and faithful, they have done much in keeping up the virility of the race, and in leavening those debasing influences of over-civilization. The all-inspiring motive of every true sportsman is fair play and a fair chance to the animal or bird whose life may pay the forfeit in the contest. The salmon must be lured from the foam-crested pool with a fragile, artificial fly and landed with a rod so light that perhaps an hour may pass before the hand-net is used; the grouse must be plucked from mid-air by a tiny gun, and the mountain sheep shot at 500 yards with a bullet smaller than a pencil tip. Within the ranks of civilized man, where do such rules prevail? In business competition, in the race for social and public honors, in all those contests wherein Mammon or



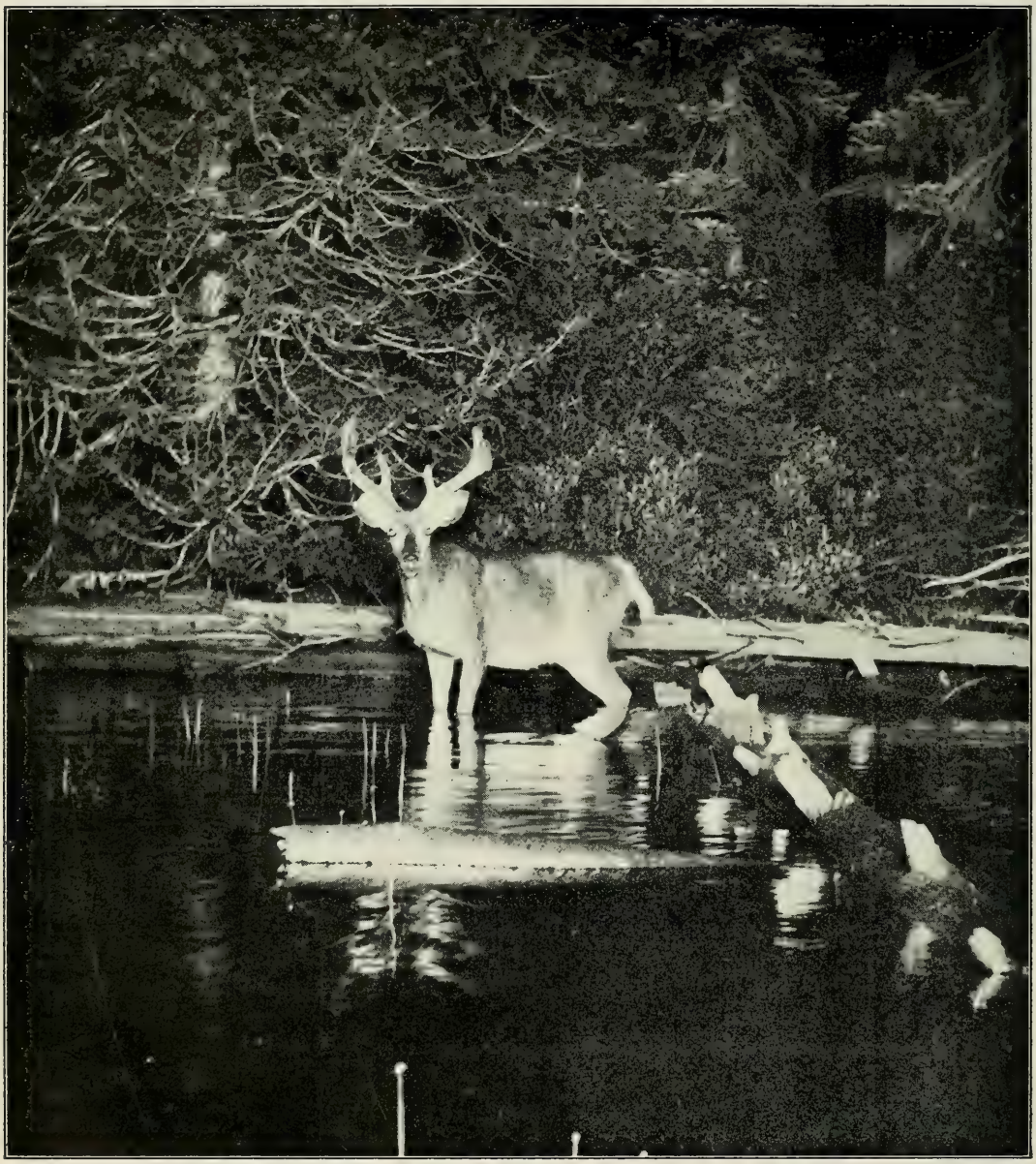
Flashlight. Large Doe and Yearling Buck, Feeding at the Mouth of the Upper White Fish River, Michigan



Flashlight. Elk Naturalized on South Shore of Lake Superior. Three cows and a native calf



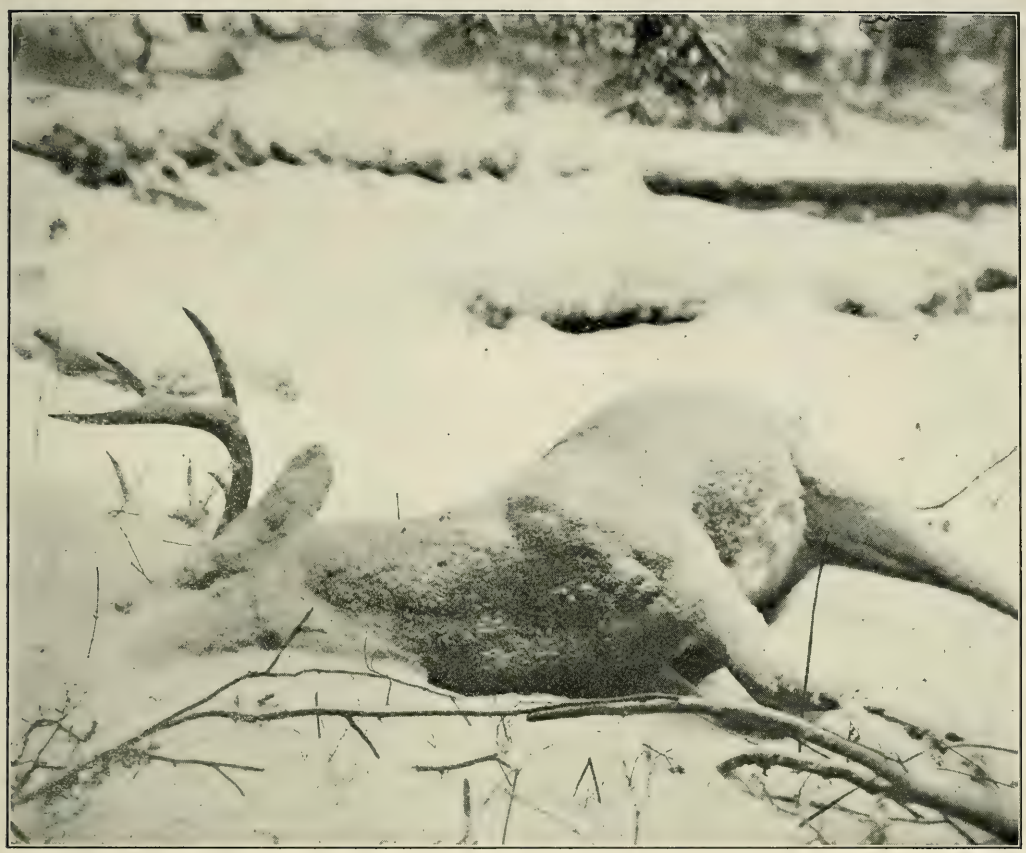
Flashlight. Young Bull Elk, Feeding on Maple Leaves, Small Lake, Upper Michigan



Flashlight. Red Deer, Chinichoochichi Lake, Canada

When flash was fired the animal was mistaken for a caribou

Ambition holds the tiller and guides man on to victory or defeat, how often is the "square deal" the guiding light? Would any one suppose if President Roosevelt, after his graduation from æsthetic Harvard, had spent his life within the narrow sphere of his birth that his career would have been the same? Or that if he had



The Hunter's Victim

Mortally wounded before a snow storm, it was never found by the hunter

merely lived within a Dakota ranch, with his hand on the branding iron and his mind upon the cash value of each season's round-up, that his nature would have been the same? Self-reliance, quickness of purpose and of action, and a broad view of man as Nature's noblest creation seldom come to one who forms but an insignificant atom in a conventional assembly of mankind. While, therefore, it becomes my part to point out an additional and perhaps wholly superior method of enjoyment for the wilderness hunter, I can but protest against any crusade which by maligning the sportsman may prejudice him against the camera, or, what is even worse, lead him to give up his yearly visits to Nature's realms, wherein lies the inspiration for a better and stronger life within the city's walls.

Many years had elapsed before the advent of the hand camera made game photography at all practicable, but within two seasons, after my experiments with it, the full possibilities began to be most apparent. It may, therefore, be of interest in this connection to reprint a few extracts from the first article ever published advocating the use of the camera in the field of sportsmanship:*

"A sportsman's life consists largely of three elements—anticipation, realization, and reminiscence. We look forward to

*Forest and stream, 1892.

Deer Taking its own Picture

The thread attached to the camera stretches from bank to bank. The picture was taken in June and shows the gaunt character of the deer during the fly season. Michigan

the trip by rail, by canoe, and then perhaps a tramp on foot into the heart of the wilderness. Then come the camp and its pleasant environments, and that lucky, radiant day when the early morning sun casts a glint upon the branching antlers of a mighty moose, as, half concealed in the thicket, he furtively and slowly browses his way along, the breathless wait until the neck or shoulder become exposed, the shot, and then—success—that is, sudden death; or perhaps success delightfully intensified by a hasty scramble after the mortally wounded beast on a blood-stained trail, at the end of which we triumphantly find our victim dead or dying.

"Would that we could realize that what is game to the rifle is game to the camera! Every true sportsman will admit that the instant his noble quarry lies prone upon the earth, with the glaze of death upon the once lustrous eye, the graceful limbs stiff and rigid, and the tiny hole emitting the crimson thread of life, there comes the half-defined feeling of repentance and sorrow. The great desideratum, after all, consists of neither meat, nor horns, nor hide, for the very next day we may be at it again, if able to do so without too severe a tax on our conscience. Therefore we reach the conclusion that much of our large game, when skillfully hunted and dispatched by the modern sportsman

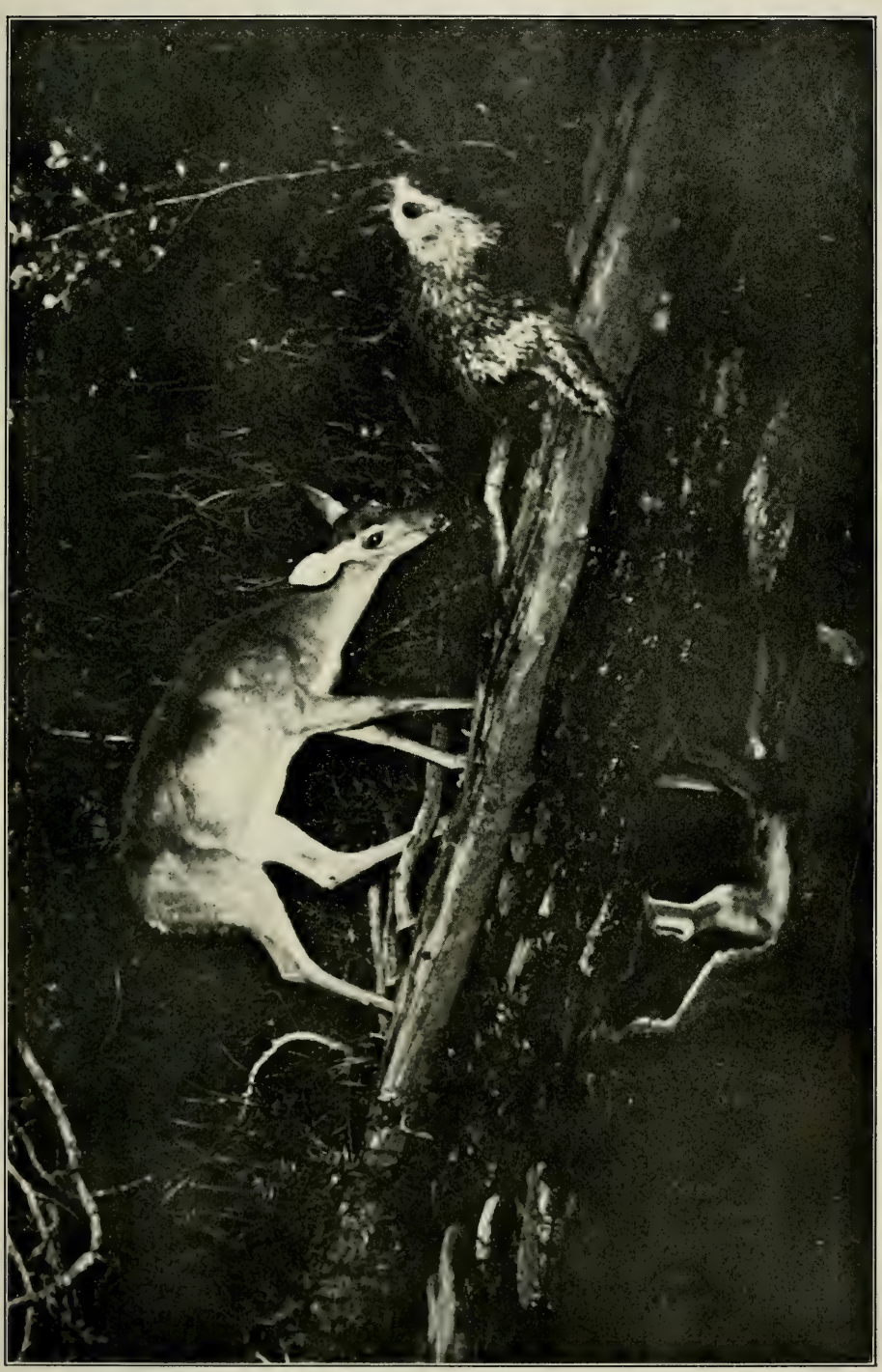
The Author's Camp

Situated in the wildest portion of Michigan, eight miles south of Lake Superior

of decent instincts, owes its extinction to an abnormal, if not fictitious, reason. Surely we do not travel a thousand miles, indifferent to time, labor, and expense, to get a few hundred pounds of wild meat, probably not half so toothsome as the domestic cuts in the market stalls of our own town or village, and costing frequently more than their weight in precious metal. Neither can hide nor antlers compensate us, except as visible evidence of our skill, for the taxidermist is ever ready to supply specimens of more surpassing beauty at half the cost. Some time we will come to recognize the fact that the real enjoyment of the outing in the woods or upon the water arises mainly in the freedom from business cares and the artificiality of city life, with the opportunity of indulging in some health-giving, exhilarating recreation, whatever name it goes under. This is especially true of the non-professional hunter of large game.

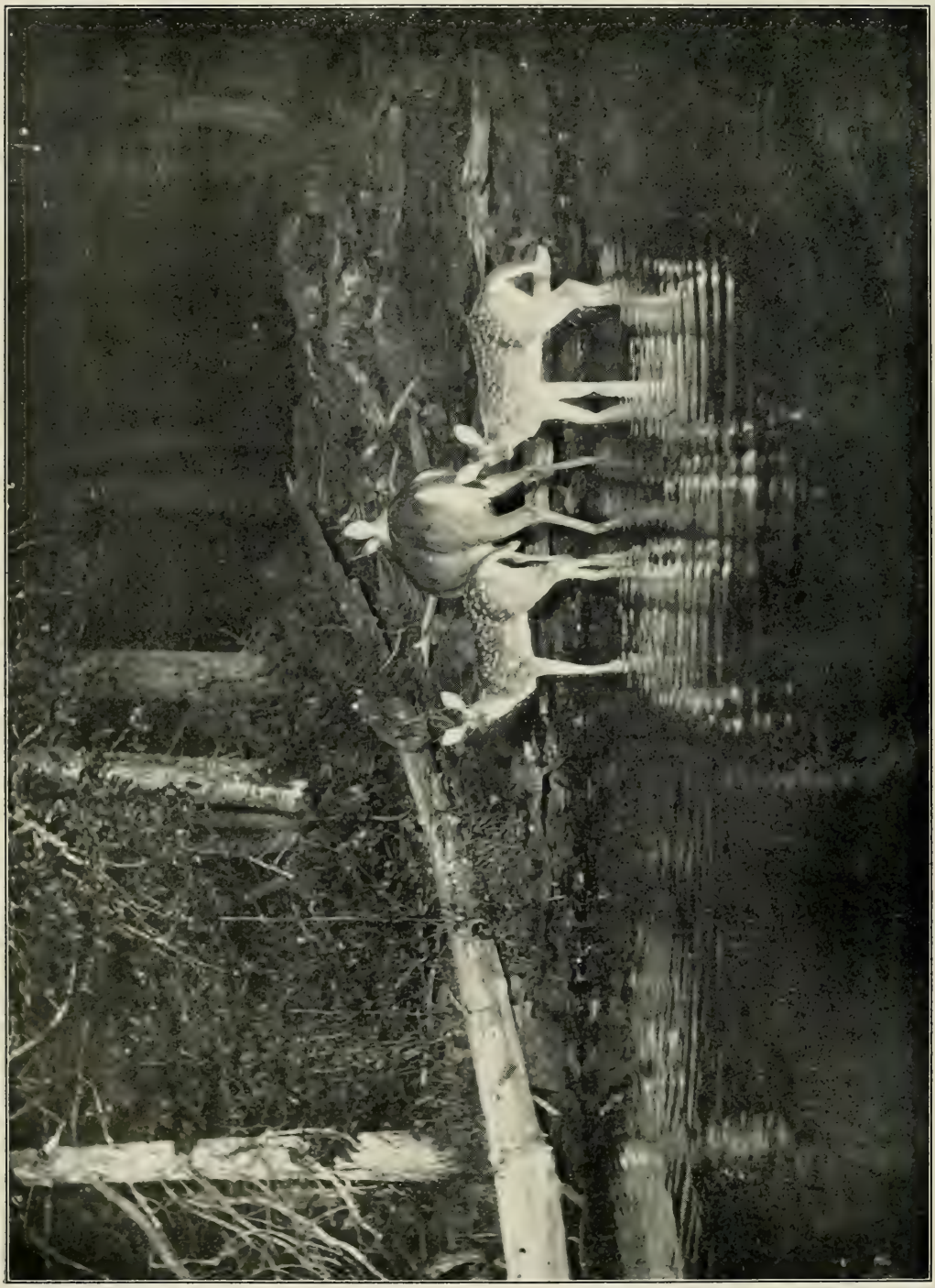
"We contentedly cast a fly all day into a swirling pool and may hardly get a bite, when a stick of dynamite would have covered the surface with a crate of trout or bass. We hopefully sit for hours shivering on the limb of a mountain oak and may contentedly return empty-handed, when the steel trap, staked pit, or set gun would have done the work equally well. The killing of large game becomes improvident, wasteful, and cruel whenever the amount shot exceeds the reasonable use for food. Many would exclaim that such a rule would put an end to every sportsman's camp; that perhaps the very first day luck would bless the greenhorn of the party with a fortuitous shot, and then the ten days' vacation would slowly elapse, while the rifles rested in the rack and the veterans sor-

Flashlight. "Monarch of the Night"
Lower White Fish River



Flashlight. Deer and Porcupine

White Fish Lake. Latter not noticed until after the flash was fired



Flashlight. "Innocents Abroad." Doe and Twin Fawns

White Fish Lake. Author was ten years trying to photograph a fawn in the spotted coat

Flashlight. Spike Horn Buck

White Fish River. Photographed at only ten feet, as deer left reeds to enter river

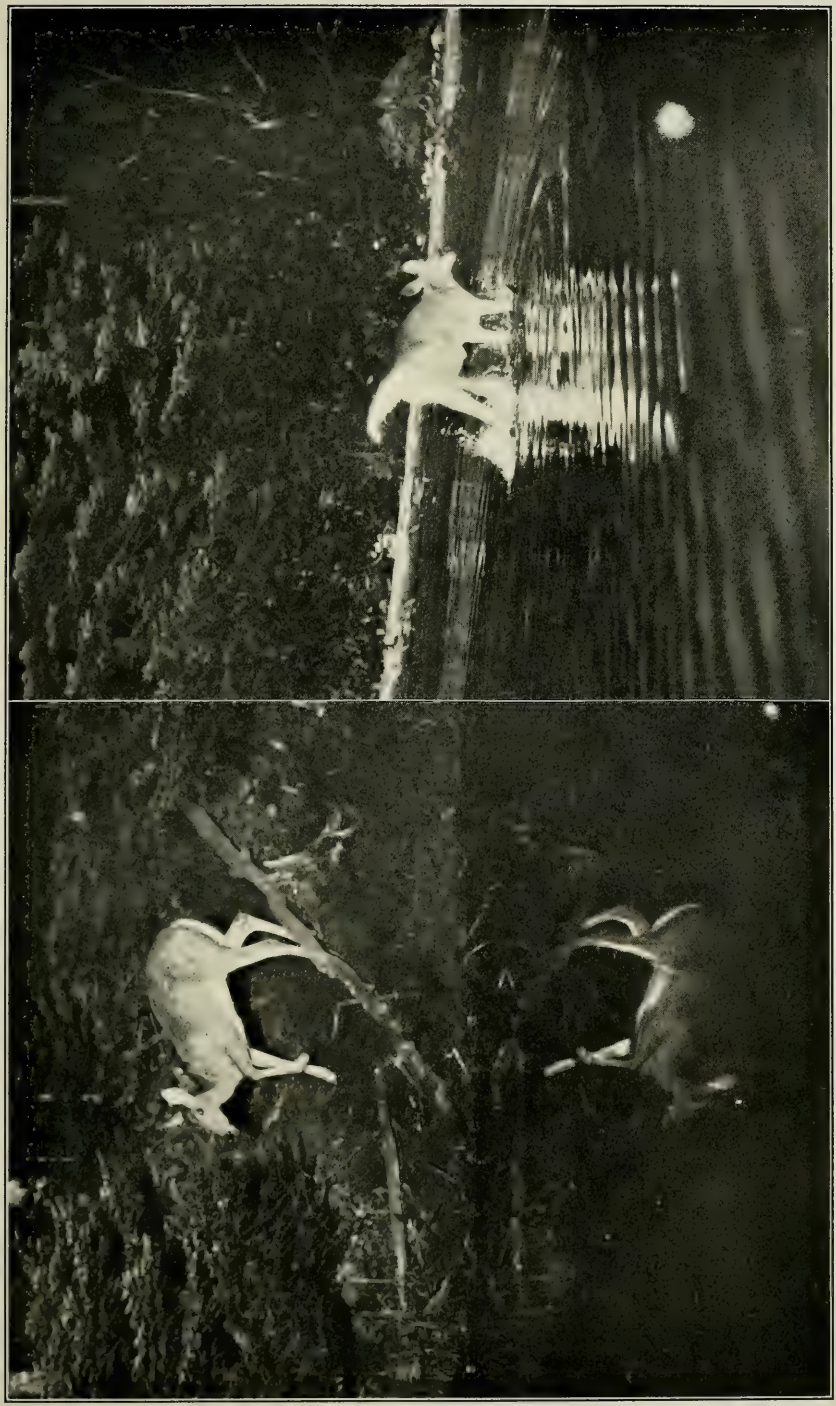
Flashlight. A Victim of the Gray Wolves Killed on the Verge of Safety

White Fish Lake

rowfully gorged themselves on musty buck until the time arrived to pull up stakes, pack the duffle, and depart for civilization. This may be true, so far as it relates to the cylinder of steel. Just substitute the camera gun, with its accurate tube of brass, and you are again equipped for sport. The game bag is never full, one's pleasures never satiated.

"Every camera hunter must admit that more immediate and lasting pleasure is afforded in raking a running deer from stem to stern, at twenty yards, with his 5 x 7 bore camera than driving an ounce ball through its heart at 100 yards. Then think of the unlimited freedom of this noiseless weapon. No closed season, no restriction in numbers or methods of transportation, no posted land, no professional etiquette in the manner of taking your game, but you can pull on a swimming deer or an elk floundering in the snow, take a crack at a spotted fawn, bag the bird on its nest, or string your cameras out like traps with a thread across the runway and gather in the exposed game-laden plates at nightfall without any scruples about being called a pot hunter or a game hog.

"While it is true that whatever is game to the gun is game to the camera, it must be particularly noted that the latter's field is much enlarged by the immense variety of birds, animals, and reptiles which are never considered fair prey for the huntsman. Game in the early days was declared to be only such as was edible, and this standard exists at the present time, though certain predatory animals and those possessing handsome pelts have at times been pursued by sportsmen in the vain effort to broaden the ever-narrowing sphere of their activity. Non-game birds and animals outnumber the edible class a thousand times, and it is this great advantage which makes and will continue to make camera hunting the more attractive and permanent of the two methods of



Flashlight. Lake Matagamasing, Canada. Caught on the Jump

Lake Dewdney, Canada

Flashlight. "Hark!"

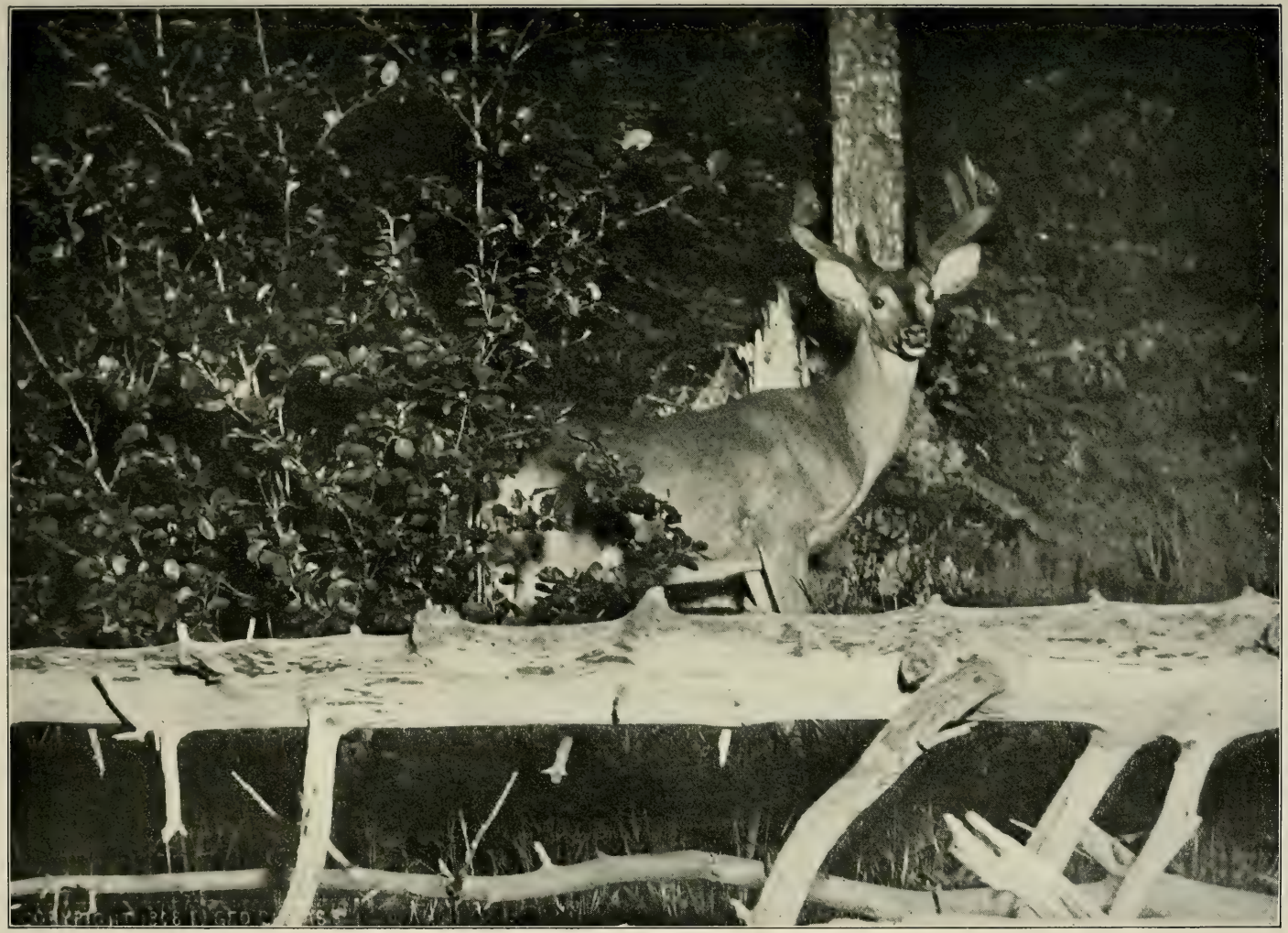
Large buck in slough, watching fluttering light of the jack on bushes beyond. Upper Michigan

Flashlight. Doe

With ears set either way and tail drawn in, it timidly watches the approaching light. Howe's Lake, Michigan

Flashlight. "Midnight Reflections"

Utterly oblivious to the jack light, it presented a beautiful picture preceding the flash.
Pond south of Lake Superior

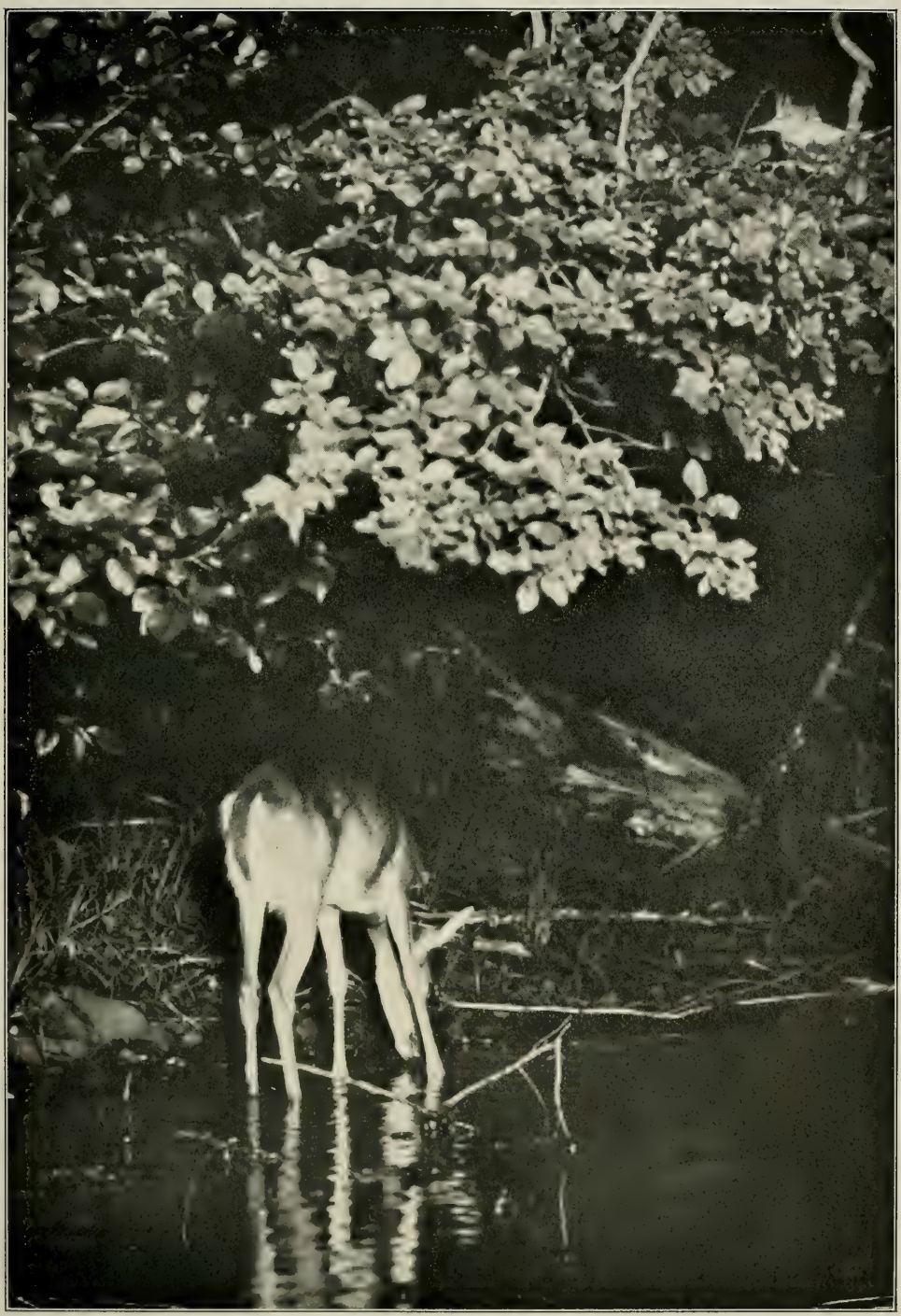


Flashlight. "Has He Gun or Camera?"

Large buck pictured when stopping momentarily to watch the jack light. La Pete's Slough, Upper Michigan

Flashlight. "A Midnight Wader"

Yearling buck, showing the large white tail, which gives this deer its name. Pictured in shallow water fifty yards from shore



Flashlight. Doe

Bear Bay, near Lake Superior. Note kingfisher asleep in upper right hand.

Flashlight. Porcupine Invades Houseboat

White Fish Lake. Flash fired as animal starts for gang plank

pursuing wild life, and at the same time largely counterbalance the greater difficulty of photographing birds or animals when compared with the ease of shooting the same under similar circumstances; for the difference between stalking within rifle range of a moose, a deer, or a bear and getting within a few yards of the same, in broad daylight, with the camera, need not be pointed out. The restrictions upon the gun which prevent the sportsman hunting the golden eagle, the snowy owl, the graceful flamingo, the gulls, herons, hawks, and those hundreds upon hundreds of birds, varying from the tiny humming bird to the mighty condor, do not apply to the man with the camera or prevent him from picturing the myriads of animal life, wherein the porcupine, the wild cat, the coon, the wolf, the alligator, or the sea-lion may be considered the fairest and most attractive kind of game, because requiring the same skill and the same patience which leads the sportsman to pursue to the death those varieties of animals which a fictitious reason allows them to kill for sport, under the assumption that their edible qualities is a justification.

"It is only within the last few years that compact photographic appliances, quick shutters, rapid dry plates and films have made possible successful work on large game, or otherwise some of us might have reformed before. The longer we have hunted and the greater our success, the less able are we in after years to recall many of such scenes with satisfactory distinctness. We have taken too many mental photographs, so that our gray film fails to be clearly and permanently impressed with the thousand

scenes of slaughter the eye has successfully focused. Not so with the camera hunter. Each year adds value to his successful shots, and when he departs for the happy hunting grounds his works live on forever.

"Generally speaking, it is a patent fact that in the more remote portions of our country the largest of the great game fall singly and in bands without any pretense that the meat itself can be possibly used, and this is especially true of the moose, elk, caribou, and formerly of the buffalo. In many instances the horns and hide become a handsome trophy, but at a cost far exceeding their commercial value. Wherefore this anomalous state of affairs?

"If the incentive pulling the trigger is the flesh pot or the purse, the case is incurable. To the professional hunter the camera would be a hollow mockery, and a plate containing the image of a deer instead of a solid chunk of venison a Barmecidal feast. Killing game by the professional is purely a matter of business, like cutting cordwood, and therefore gauged upon a different, but nevertheless much more rational, principle than the one which governs most of us in hunting."

The above plea for the camera in hunting has since been supplemented by many other sportsmen and naturalists, until, at the present time, hardly a month goes by that some new and forcible reason is not given for the substitution of the camera for the gun.

While a number of the present illustrations were taken in the daytime, this method of photography is now so well known that I will not attempt to describe such pictures in detail; but in view of the fact that I was the first to attempt flash-light pictures of wild game, and for the first fifteen years was the sole occupant of this attractive field of photography, it may be of interest to the readers of this article to learn something about this rather odd way of picturing wild animals, at a time when the hunter ordinarily is sound asleep.

When going out for the first time in the dead of night, in the silent, trackless forest, or upon the placid bosom of some little lake, searching for game photographs, with the way feebly lighted by a bull's-eye lantern on one's head, or the lamp fastened to a stick in the bow of a frail canoe, one is apt to think it is a venture unlikely to meet with much success, however great the novelty of such an expedition.

However, the pictures herein produced are but a few of the many obtained in the past, and indicate that night hunting with the camera, while of course difficult, is still not barren of results.

Like all pastimes worthy of permanent existence, considerable skill and patience is required, doubly rewarded, first by the fascination of life amid Nature's secret haunts, and secondly in the beautiful and permanent game pictures which the camera hunter obtains when his efforts are properly directed.

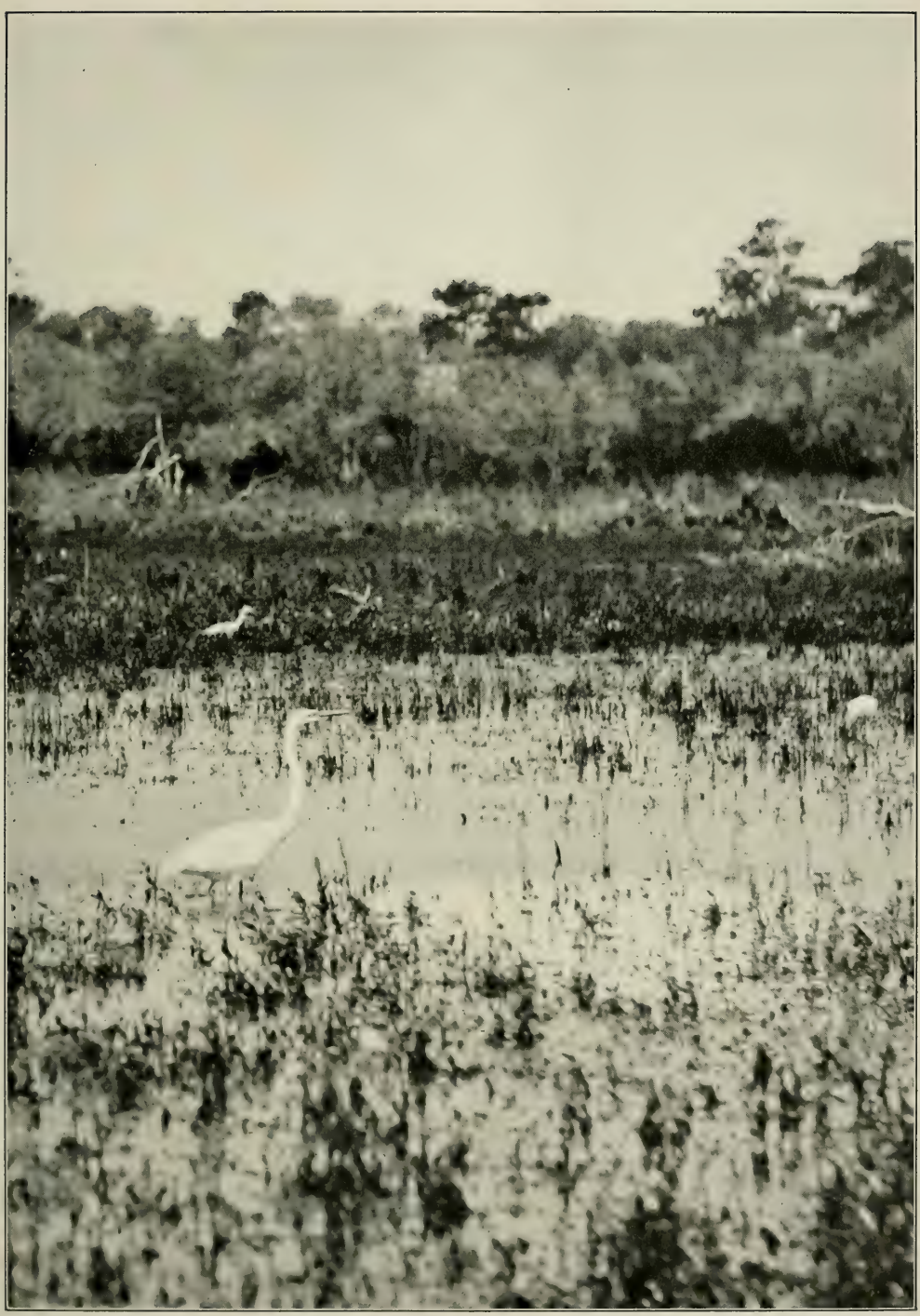
A brief description of how these night pictures were taken may not be out of place. Ordinarily it is preferable to seek the game along the water-courses, and, as most wild game are largely nocturnal in their habits, the writer has usually sought his game in a boat rigged especially for such purpose.

In the bow of a light fourteen-foot boat is set a frame upon which two cameras are placed, focused at from thirty to forty feet; above this is placed a lamp with a strong reflector, which throws the rays directly in front of the boat.

The deer and the moose feed among the lily pads and grasses along the edge of the stream or lake. They are not ordinarily frightened by the approach of a light, their curiosity being very strong and the bright rays of the lamp blinding them, so that they cannot see the boat or its occupants. This method of approaching game is well known to hunters, and is called "hunting with a jack-light." It has been the subject of some discussion among the sportsmen as to whether this method is legitimate, nearly all contending that it does not give the deer a chance for his life, which true sport demands.

Yellow Hammer or Flicker at Nesting Hole

Revell's Island, Virginia. The picture was taken with a portrait lense, the camera being concealed in a bush, four feet away, while the author, 20 yards distant, pulled the string

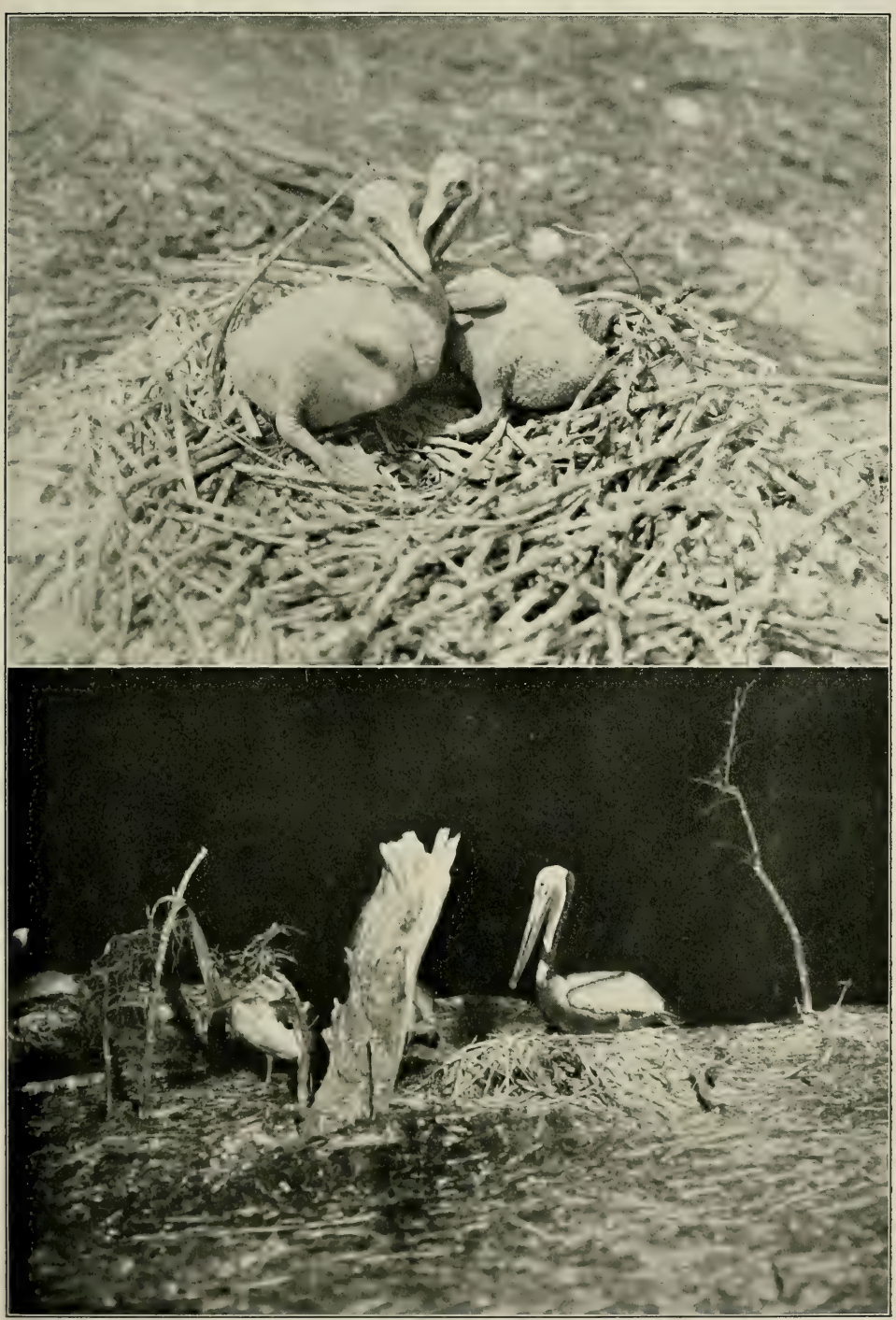


The Great White Heron

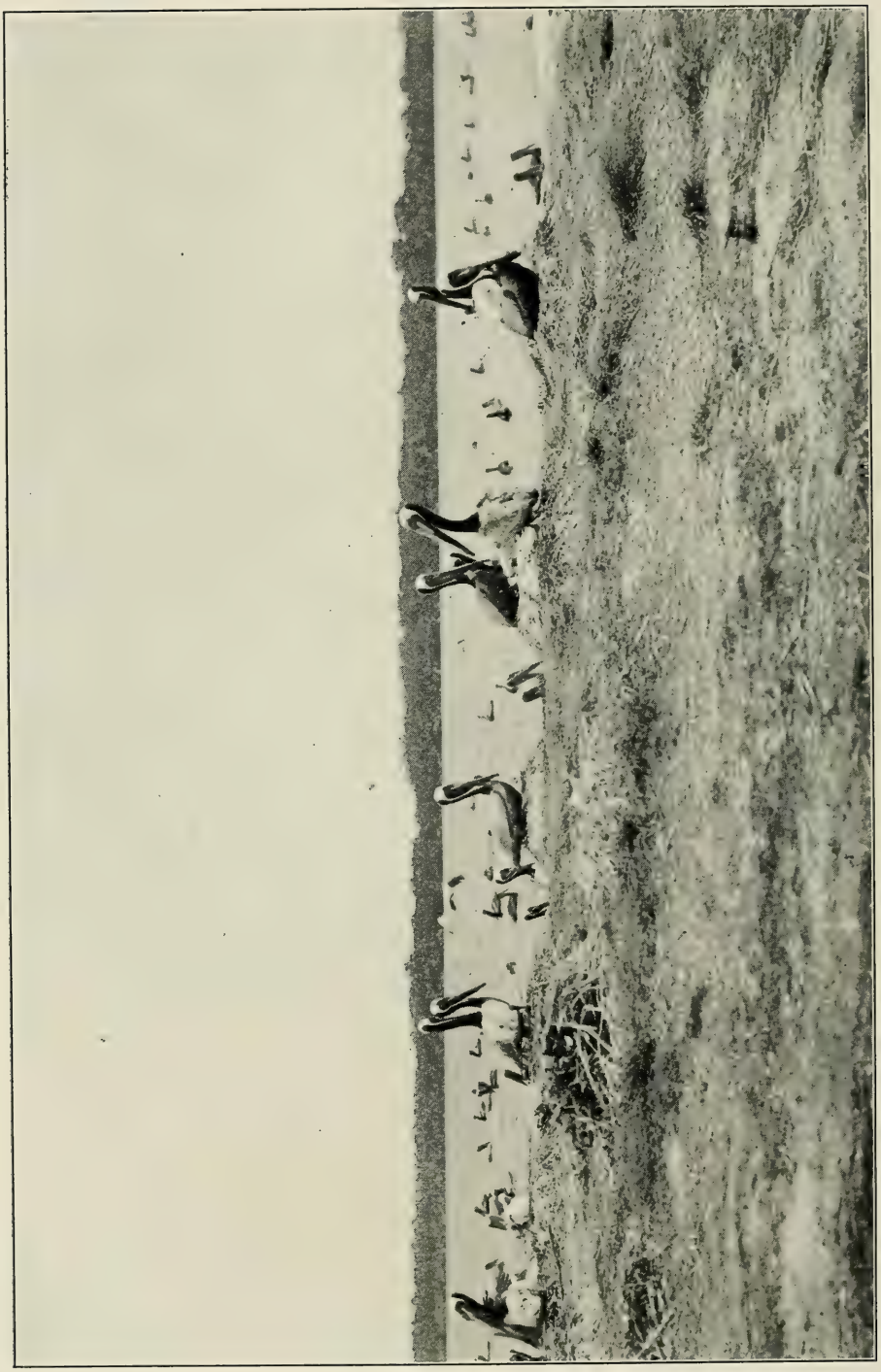
Brackish pond, Cumberland Island, Georgia. This bird is nearly extinct in North America

"Dignity Personified"

Young brown Pelican in downy stage. Indian River, Florida



Young Pelicans protesting against the Camera. Flashlight of Pelican on Nest



Pelican Island, Indian River, Florida, during the Nesting Season

The Little Blue Heron in the White or Immature Stage

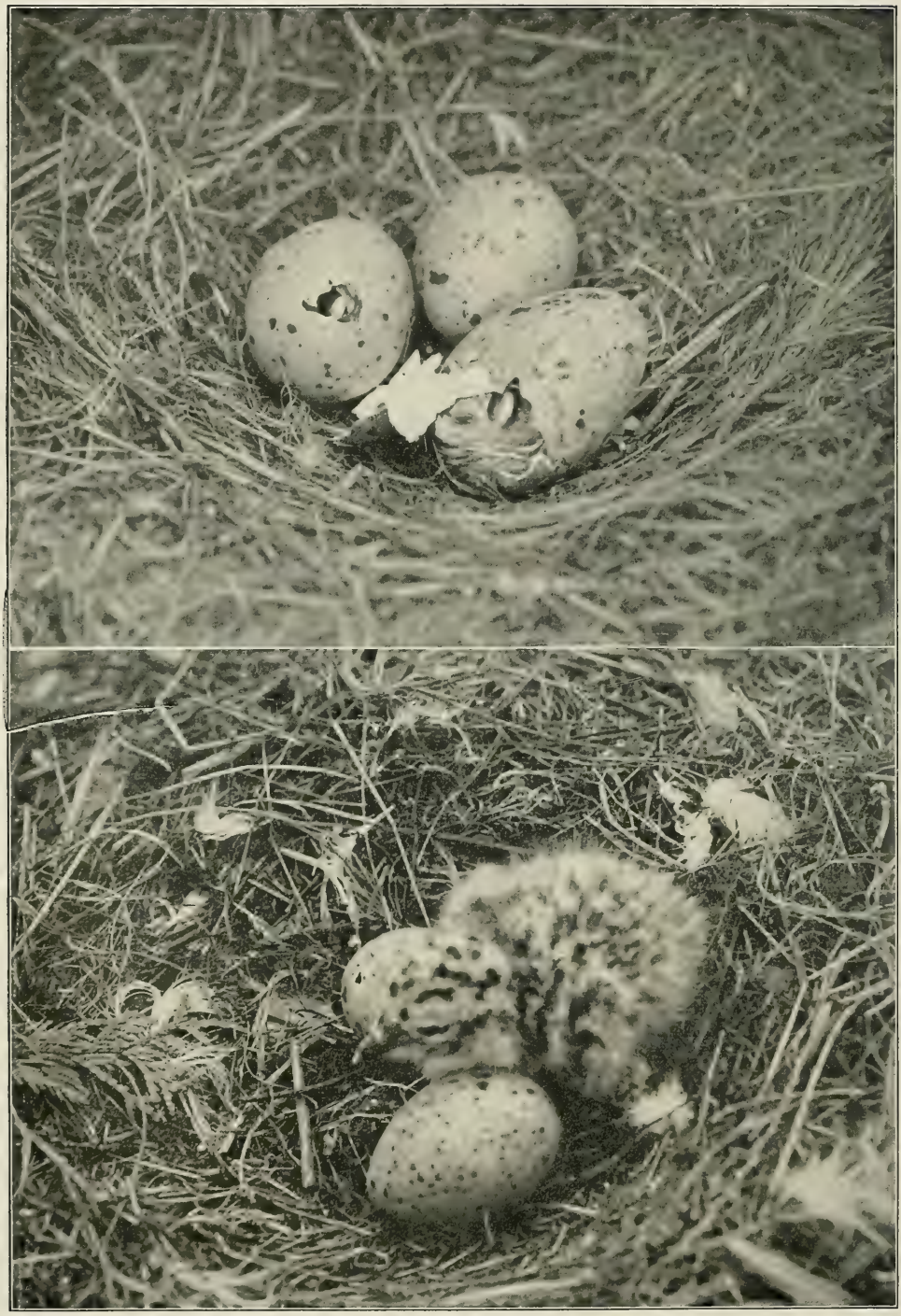
Cumberland Island, Georgia. Note the yellow-leg plover in left-hand corner

Osprey or Fish Hawk Flying over Nest

Eastern shore of Virginia

Mallard Duck on Nest. Mallard Duck Nest with 14 Eggs

Northern Michigan

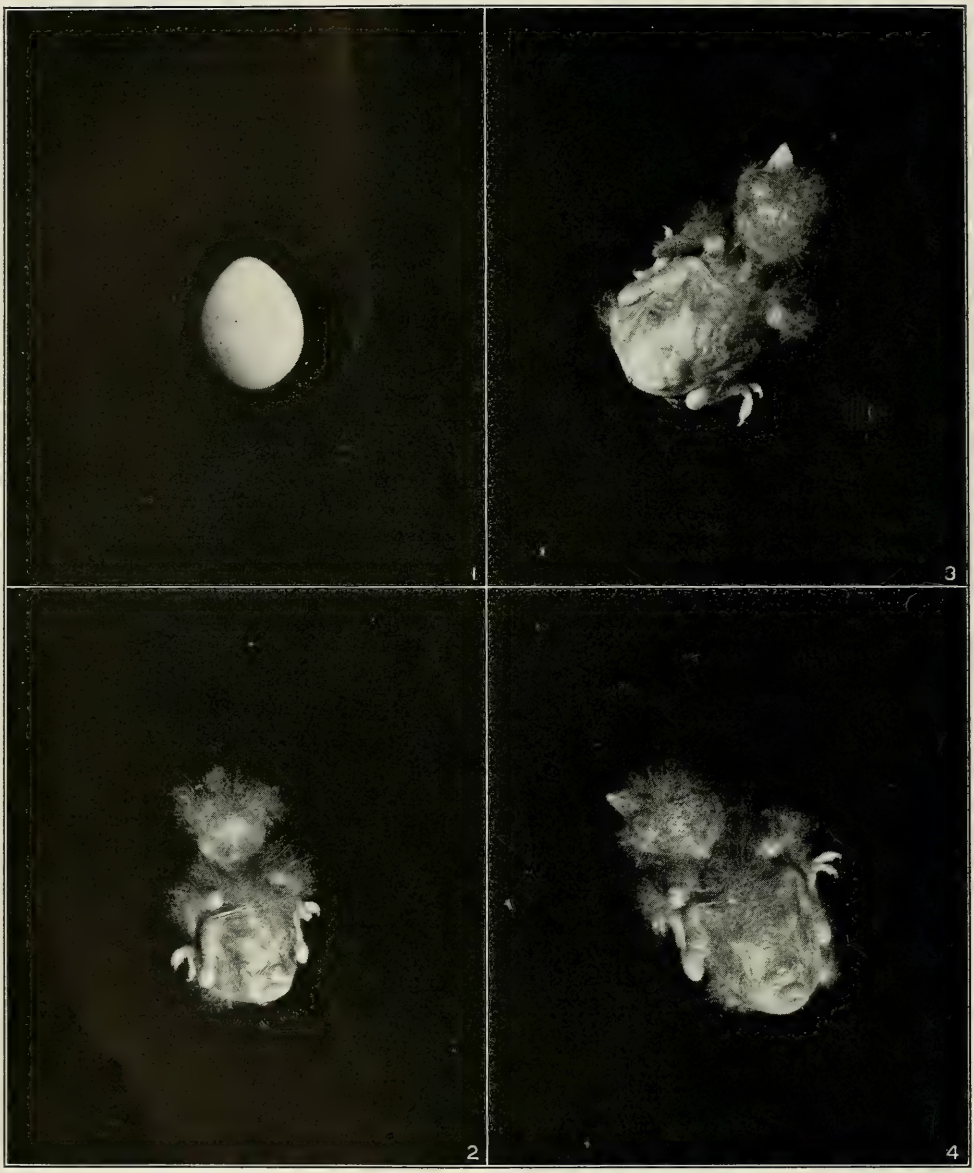


Eggs of the Herring Gull Just Hatching. Young Herring Gull Out of the Shell Five Minutes

Gull Island, Lake Superior

Young Herring Gull. Young Crow Blackbirds. Willett Snipe's Nest. Four Hundred Eggs of the Black-headed Gull collected in two hours

Eastern shore of Virginia. A form of pillage which the Audubon Society has nearly stopped

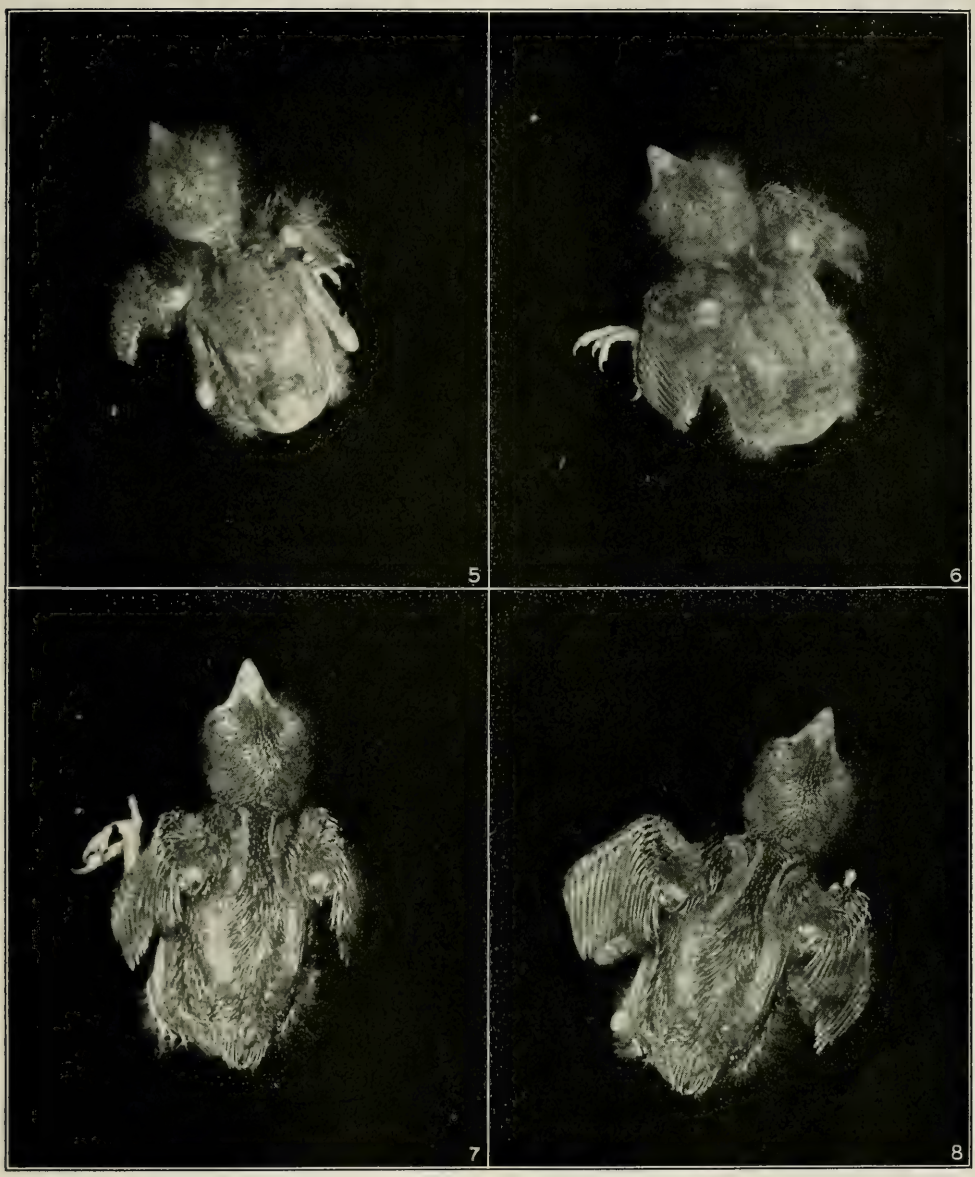


The Egg of a Phœbe (Flycatcher) and seven consecutive days' growth of young (life size)

Alger County, Michigan

That, however, is a question which does not concern us at present, as our hunting is not destructive.

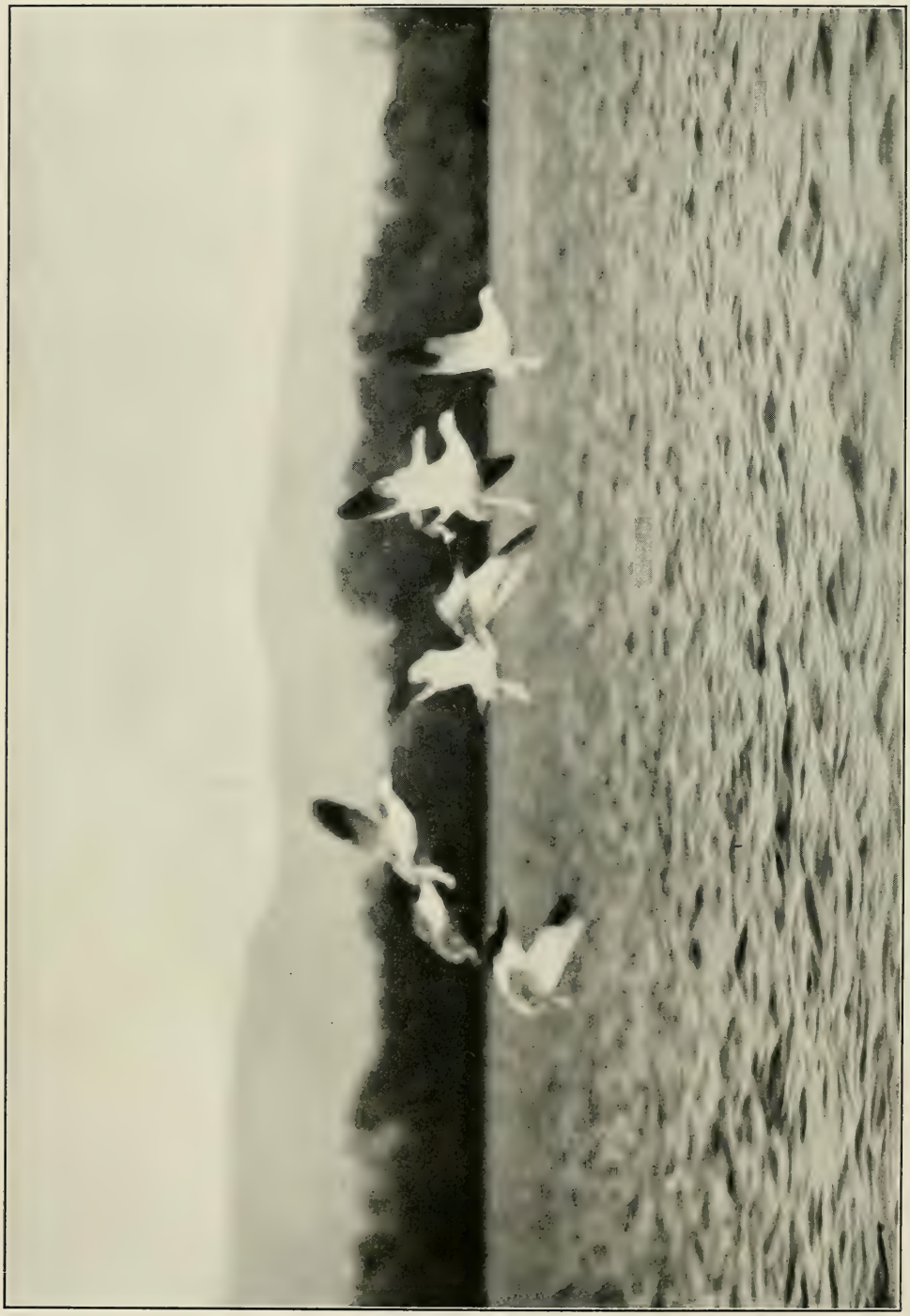
Having selected a dark, warm night, a flash-light hunter prepares his cameras, lights the jack-lamp, loads his flash-light apparatus with magnesium powder, and in his canoe pushes out into the silent



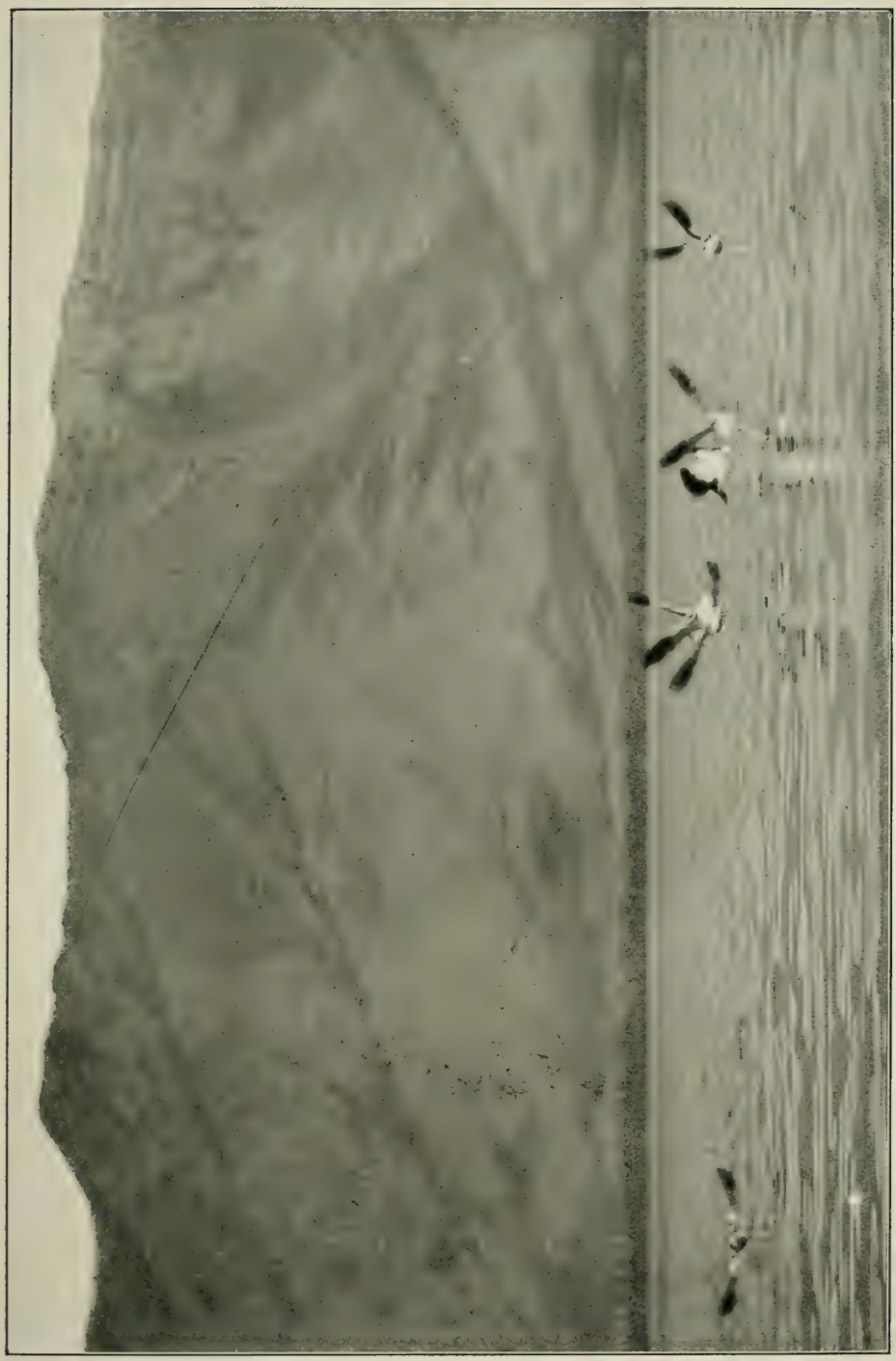
The bird left the nest on the eleventh day

waters of the lake or river. The paddle sends the slight boat ahead so easily that no sound is heard except a gentle ripple, unnoticeable a boat's length away. The wooded banks are wrapped in deepest shadow, only the sky-line along the crest showing their course.

At the bow of the boat the bright eye of the jack-light is turning from side to side, cutting a channel of light through the waves of darkness, showing, as it sweeps the banks, the trunks of trees and tracery of foliage with wonderful distinctness.



Avocets Flying over Henry's Lake, Idaho
This picture should be viewed at arm's length



Stilts, Henry's Lake, Idaho, with the Rocky Mountains as a Background

Young Sandhill Crane

Central Florida. This southern species is nearly exterminated

Butterflies Feeding on a Dead Pickerel
White Fish Lake

Flashlight. Coon Taking His Own Picture

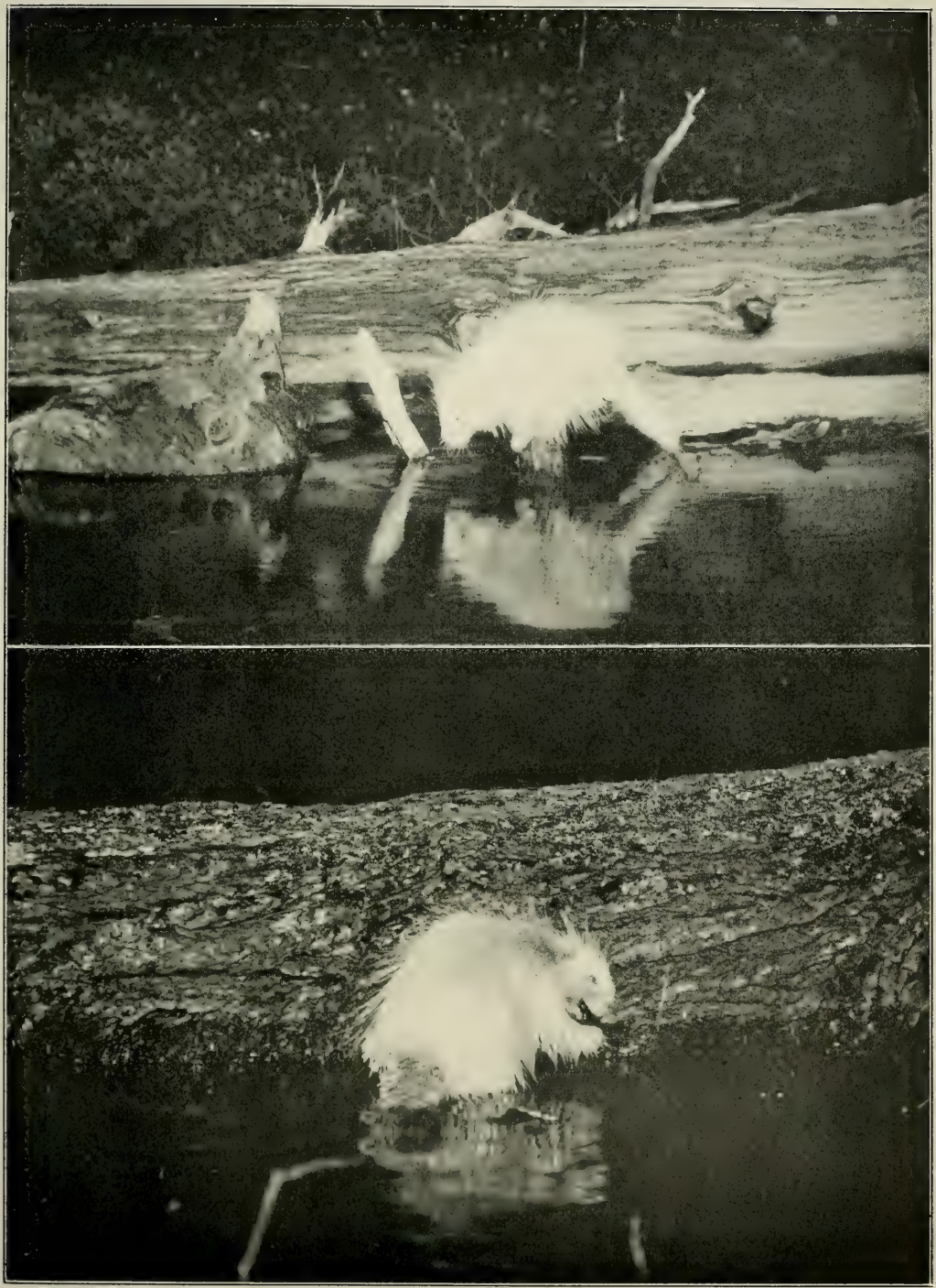
String connected with flashlight, baited with small bass. White Fish Lake, Michigan

Flashlight.—Coon Taking His Own Picture

String baited with old cheese. In more than thirty years coons had never been seen in Upper Michigan

Soon the quick ears of the men in the boat detect the sound of a deer feeding among the lily beds that fringe the shore. Knee-deep in the water, he is moving contentedly about, munching his supper of thick green leaves. The lantern turns about on its pivot and the powerful rays of light sweep along the bank whence the noise came. A moment more and two bright balls shine back from under the fringe of trees; a hundred yards away the deer has raised his head and is wondering what strange, luminous thing is lying out on the surface of the water. Straight toward the mark of the shining eyes the canoe is sent with firm, silent strokes. The distance is only seventy-five yards, now it is only fifty, and the motion of the canoe is checked till it is gliding forward almost imperceptibly.

Combined Daylight and Flashlight of a Porcupine Feeding on Pond Lilies
Flash fired at 7 p. m. in July



Flashlight. Albino Porcupine Pictured on Four Successive Seasons in Same Bay White Fish Lake. The second of its kind ever reported

Young Night Heron
Central Florida

A Blue-Haired Quilless Porcupine
A freak of nature. White Fish Lake, Michigan

Mocking Bird in Florida Orange Grove Pecking at Fallen Fruit

Cedar Bird

Lake Superior. Daylight: background of balsam 100 feet away

Yellow-leg Snipe
South shore of Lake Superior

Black-headed Gull
Eastern Shore of Virginia

Great Northern Hare

Upper Michigan. Turns white in winter. Animal photographed when eating salty paper from the camp. Largely nocturnal

Wing Shooting with a Camera. Robin Snipe

Eastern shore of Virginia. Circling over decoy. Several are dropping. 1/1000 second exposure

Bonaparte Gulls

Halifax River, Florida. Note the bird pecking at crust of bread

Broad-bill Duck

Mosquito Lagoon, Florida. Hold this picture at arm's length.

Snipe Shooting over Decoys

110 bagged in one shot. Flying 75 miles an hour. 1/1000 second exposure. Revels Island, Virginia

Flashlight. Great Blue Heron Asleep

White Fish Lake, Michigan. One of the wariest of birds. This is the first flashlight of a wild bird ever taken. 1893

Flashlight. Snowy Owl

White Fish River, Michigan. Author was looking for deer. Flash held in one hand and camera in the other. The owl fell 15 feet into the water, swore like a trooper, and waded ashore

Flashlight. Bull Moose

Matagamasing Lake, Canada. At edge of Muskeg watching jack light

Flashlight. Cow Moose

Wahnopitae Lake region, Canada. When flashlight was fired the moose charged the canoe, knocking the camera overboard. Negative immediately developed and saved. Note the "bell"

Flashlight. Bull Moose

Matagamasing Lake. Animal feeding on lily roots in five feet of water. Flash fired just as head came up. Note water pouring off neck. Author was five seasons getting a night picture of a bull moose

At this point, if the hunting were with the firearm, more largely employed, there would be a red spurt of fire from under the jack-light, and the deer would be struggling and plunging toward the brush; but there is no sound or sign of life, only the slowly gaining light. Twenty-five yards now, and the question is, Will he stand a moment longer? The flash-light apparatus has been raised well above any obstructions in the front of the boat, the powder lies in the pan ready to ignite at the pull of a trigger; everything is in readiness for immediate action. Closer comes the boat, and still the blue, translucent eyeballs watch it. What a strange phenomenon this pretty light is! Nothing like it has ever been seen on the lake during the days of his deerhood. Fifteen yards now, and the tension is becoming great. Suddenly there is a click, and a white wave of light breaks out from the bow of the boat—deer, hills, trees, everything stands out for a moment in the white glare of noonday. A dull report, and then a veil of inky darkness descends. Just a twenty-fifth of a second has elapsed, but it has been long enough to trace the picture of the deer on the plates of the cameras, and long enough to blind for the moment the eyes of both deer and men. Some place out in the darkness the deer makes a mighty leap; he has sprung toward the boat and a wave of water splashes over its occupants; again he springs, this time toward the bank; he is beginning to see a little now, and soon he is heard running, as only a frightened deer can, away from the light that looked so beautiful, but was in fact so terrifying. What an account he will have for his brothers and sisters of the forest of a thing which he himself would not have believed if he had not seen it with his own eyes. In the boat, as it slips away from the bank, plates are being changed and the cameras prepared again for another mimic battle.

Sometimes the pursuit is varied by letting the deer take its own picture.

A string is passed across a runway, or other point where the deer are likely to pass, which, when touched, sets off the trigger and ignites the magnesium powder. The same method can be used for daylight pictures, except that here a slender black thread is laid across the path, one end of which is attached to the shutter of the camera. The shutter revolves as soon as there is any pressure upon the thread, and a picture of any passing object is taken instantaneously. Not the least interesting part of this species of photography is that the operator does not know until he develops his plates what manner of beast, bird, or reptile has caused the shutter to open.

So the days pass on and the nights, with all the scents of the woods and the thousand charms of nature and of wild life; all the zest of pursuit, all the setting of the wit of man against the wit of wild beast, all the preparation for the chase, and all the cunning of pursuit, to be rewarded with tangible evidences of human skill and patience which will long outlast the details of the scene as caught by the most powerful memory.

SOUTH AMERICA

THE August number of this Magazine will be devoted principally to South America, in view of the attention directed to that region by the Pan-American Conference at Rio Janeiro during August and September. A map of the continent, 12 by 18 inches and in 6 colors, will be published; the contents include "South America 50 Years Hence," by Mr Charles M. Pepper, author of "Panama to Patagonia;" "The Niagara of South America—the Falls of Iguazu," by Mrs Robinson Wright, author of "The New Brazil;" "The Republic of Chile;" "Across the Peruvian Andes to the Plain of the Amazon," by Prof. S. J. Bailey, of Harvard College Observatory, who established the El Misti observatory; "The Shattered Obelisk of Mont Pelée," by Prof. Angelo Heilprin, and other articles.

GROWTH OF FLORIDA

THE report of the census of Florida, taken in 1905 and recently made public, shows a population of 556,690, excluding the counties of Dade, Escambia, and Orange, the census of which is incomplete. This shows an increase over 1900 of 15 per cent, a fairly rapid rate of growth. Of the population, 56.5 per cent are white and 43.5 per cent are negro, showing a slight decrease in the proportion of negroes since 1900, when it was 43.7 per cent.

As in other states, the population of cities and towns has increased more rapidly than has the rural population. The largest cities are Jacksonville, 35,301; Tampa, 22,823, and Key West, 20,498. Of these, Tampa has had a most phenomenal growth, having increased nearly 50 per cent in the last five years. H. G.

THE GOLDEN TROUT

THE finest trout in the world, says Dr Barton W. Evermann, of the Bureau of Fisheries, is to be found in a little stream of the high Sierras in southern California, called Volcano Creek. The trout is named the "golden trout;" and in beauty of coloring, gameness, and delicacy of flavor it has no equal. So far as is known, it exists only in this stream, which is about 20 miles in length. President Roosevelt recently called the attention of the Bureau of Fisheries to this unique specimen, with the result that Dr Evermann was sent to California to study its habits and environment, and to see whether it might not be introduced elsewhere. He reports that the trout is in danger of extermination, and that fishing in the stream must be prohibited by the State of California for three years, if the trout is to be saved. Dr Evermann has also recommended that the Bureau of Fisheries undertake the artificial propagation of the trout, and coöperate with the State of California in transplanting it to a number of barren streams that can be easily reached. The trout has been named *Salmoni roosevelti,* in honor of President Roosevelt. The Bureau of Fisheries has published a handsomely illustrated report on the trout by Dr Evermann.

RESTOCKING OUR RIVERS AND WATERS WITH FISH

THE popularity of the government's efforts through its Bureau of Fisheries to maintain the supply of native fishes and to stock barren or depleted waters is yearly increasing. By delivering fish at the nearest railway station free of charge to applicants and rendering assistance in various other ways, the Bureau encourages the utilization of private and interstate waters. The great commercial fishes are for the most part planted by the Bureau's employees directly in public waters.

The regular fish-cultural work of the Bureau is now addressed to about fifty different species, while a number of others are handled from time to time, and new fishes are yearly added to the list of those cultivated. The list includes the principal food and game fishes in all parts of the country, and so comprehensive have the operations become that few economically important

fishes of the lakes and streams are now neglected. The salmon and bass families have the largest number of species among those handled, but twelve other families also are represented.

About 1,750,000,000 fertilized eggs, fry, fingerlings, yearlings, and adults are distributed each year, each state and territory sharing in the distribution. Pike perch rank first, with 400,000,000; then come white fish, 330,000,000; flatfish, 203,000,000; cod, 170,000,000; yellow perch, 145,000,000; lake herring, 122,000,000; salmon (Chinook, silver, and blue back), 135,000,000; lobster, 116,000,000; lake trout, 41,000,000; brook trout, 10,000,000; shad, 33,000,000; white perch, 25,000,000; pollock, 8,500,000; bass of various kinds, 4,500,000.

In distributing the product of the hatcheries six special cars are employed. These cars are provided with small permanent crews, are equipped with all necessary apparatus for the safe carriage of young and adult fishes, and are attached to passenger trains. Many of the railroads, appreciating the benefits arising from the stocking of waters along their lines, render this service gratis.

PAPER FROM COTTON STALKS

A RECENT number of the *Manufacturers' Record* makes the following interesting statement:

It has been demonstrated that all grades of paper, from the best form of linen grade to the lowest, can be manufactured from cotton stalks. In addition to this, a variety of by-products, such as alcohol, nitrogen, material for guncotton and smokeless powder, can also be secured in paying quantities.

The time is not now far distant when paper plants equipped with all modern machinery and devices for making paper and the utilization of the other by-products referred to will be built and placed in operation throughout the cotton-growing states of the South. The establishment of these mills for the manufacture of paper from cotton stalks will develop a new industry of enormous proportions and institute the utilization of a waste product which at the present time has comparatively little or no value. It will prove the entering wedge of checking the present increasing cost of paper.

It is estimated that on an area of land producing a bale of cotton at least one ton of stalks can be gathered. Upon this basis of calculation this new industry can annually depend upon from 10,000,000 to 12,000,000 tons of raw material. This will not only furnish necessary supplies to meet all home demands, but also permit of the export of pulp or finished products to foreign countries. At the present time there is approximately $287,000,000 invested in paper mills in the United States, with but few plants located in the South. The bulk of the material going into the manufacture of paper at the present time is spruce pine, which is annually becoming more expensive on account of the depletion of the forests and the high prices which such timber commands in the markets for other uses. The utilization of a waste product such as the cotton stalk, manufactured into commercial paper, will be a boon of inestimable value to the whole country.

The practical effect of this new invention will be to increase the present value of the South's cotton crop nearly $100,000,000 annually. With the removal of the cotton stalks from the fields in the early fall, the death knell of the boll weevil will be sounded.

THE SKELETON IN LURAY CAVE

Editor National Geographic Magazine:

In your June number a description is given of a recent visit to the Luray caverns by 450 members of the society, in which you kindly refer to my own early account of the same. This is peculiarly gratifying. In the course of it, however, you throw doubt on the finding of a human skeleton in one of the lower chambers. In the interest of science, permit me to state the facts.

In October, 1878, Major A. J. Brand wrote

to the *New York Herald,* saying: "Greatly to our surprise, our candles flashed upon the perfect petrified skeleton of a man in kneeling posture, with head thrown back as if he had died in agony. Several medical gentlemen have examined it. * * * That it is the skeleton of a man there is no doubt." My own visit was a few weeks later. I wrote for the *Scientific American,* in a series of articles, a full description of all the contents of Luray Cave. Of the skeleton I said: "In a gulch near the Imperial Spring human bones are visible, including a jaw with three tooth sockets, the femur, the tibia, and the ribs—the latter fractured. The remainder of the skeleton is concealed under dripstone." I had these bones examined by local physicians, who declared them to be the remains of a young person, and our conclusion was that the remains had been there for fully 500 years. On subsequent visits I observed that relic-hunters had carried away such bones as they could dislodge; and no doubt it would tax the imagination to find now what was carried away quarter of a century ago. But we saw that skeleton in 1878. H. C. HOVEY.

Newburyport, Mass., June 26, 1906.

Rise of the New West. 14th volume of the "American Nation Series." By Frederick Jackson Turner. Maps and index. 366 pp. New York and London: Harper & Bros., 1906. $2.00.

For convenience in studying the history of the nation from 1815 to 1830, Mr Turner divides the country into sections—New England, the middle region, the South and the West—and in his review of events and conditions of that period greatest attention is given to the West, not so much as a separate geographical section as to show what bearing its opening, colonization, and growth had upon national affairs. When shortly after the close of the War of 1812 the new land was offered, to all who might wish to purchase, at $2.00 per acre, with only one-quarter of that amount as first payment, settlers flocked from the East and South, and the "West" began to grow, and soon became a recognized power in the economic and political affairs of the nation, for, to quote a sentence of Mr Turner, "by its competition, by its attraction for settlers, it reacted on the East and gave added impulse to the democratic movement in New England and New York." F. M. A.

Statesman's Year-Book for 1906. Edited by J. Scott Keltie and I. P. A. Renwick. With maps. Pp. 1604. 5 x 7 inches. New York: The Macmillan Co., 1906. $3.00.

The most important change in the issue of the Statesman's Year-Book for 1906 is the addition of 150 pages devoted entirely to the United States, and giving the constitution and government, area, population, religion, instruction, justice, charity, finance, defense, productions, and industry, and books of reference relating to each state in the Union. This addition will make this annual publication of much greater value to Americans and is much to be commended. In the American edition the information about the United States, 223 pages in all, is placed first. One of the most valuable features of "The Statesman's Year-Book" lies in the fact that its statistics are brought up to January of the year of publication. The results of the dissolution of the union between Sweden and Norway, the conclusion of the Russo-Japanese War, the upheaval in Russia, the mission to Tibet, the ecclesiastical changes in France, the recent election in the United Kingdom, and other important events have all been duly incorporated.

There are excellent maps and diagrams showing, among other things, the new Barotseland boundary; the political changes in the Far East; the tariff chart of the world; the new provinces in N. W. Canada; the subdivision of Bengal; the economic development in the United States; economic aspects of the United States, and the races of Russia.

Hints to Travellers. Ninth edition. Edited by E. A. Reeves for and published by the Royal Geographical Society. Two volumes. Pp. 742. 5 x 7 inches. Illustrated. London, 1906.

The Royal Geographical Society has found it necessary to publish a ninth edition of "Hints to Travellers," so great has been the demand for this valuable work. A large amount of new matter has been added, such as the more recent surveys and accurate data relative to heretofore unexplored regions. An introductory chapter on geographical surveying, suited to modern requirements, and new astronomical examples are given, while the forms for computation have been altered to give greater accuracy in results. A new section on archæology, with new and important notes on anthropology, is included. For those who are not familiar with the work, it may be said that "Hints to Travellers" is probably the most thorough, practical, and valuable handbook of its kind ever published. Volume I covers clearly every point for surveys and astronomical observations and illustrates the necessary instruments and their adjustments. There are chapters on practical astronomy, observations for time and longitude, obsrvations for azimuth and error of compass, and a formulæ of plane and spherical trigonometry; also scales and projections of maps, with many diagrams and tables. Under the cover of volume I are detached maps of the northern and southern constellations. Volume II contains chapters on meteorology and climatology, with tables and charts showing temperature and winds. There are sections giving valuable medical information, notes on natural history, photography, glacier observations, and mountain travel. J. O. L.

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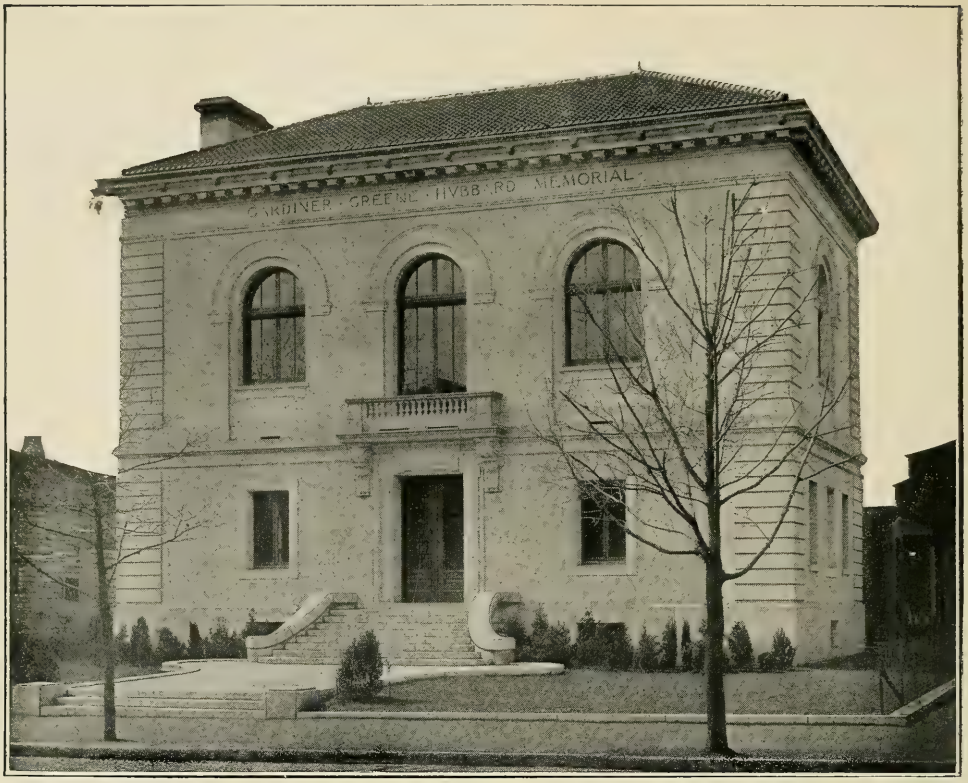

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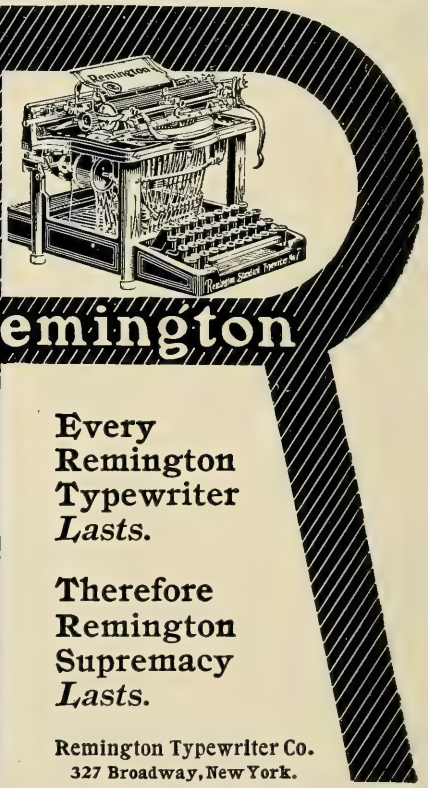

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The NATIONAL GEOGRAPHIC MAGAZINE

Vol. XVII AUGUST, 1906 No. 8

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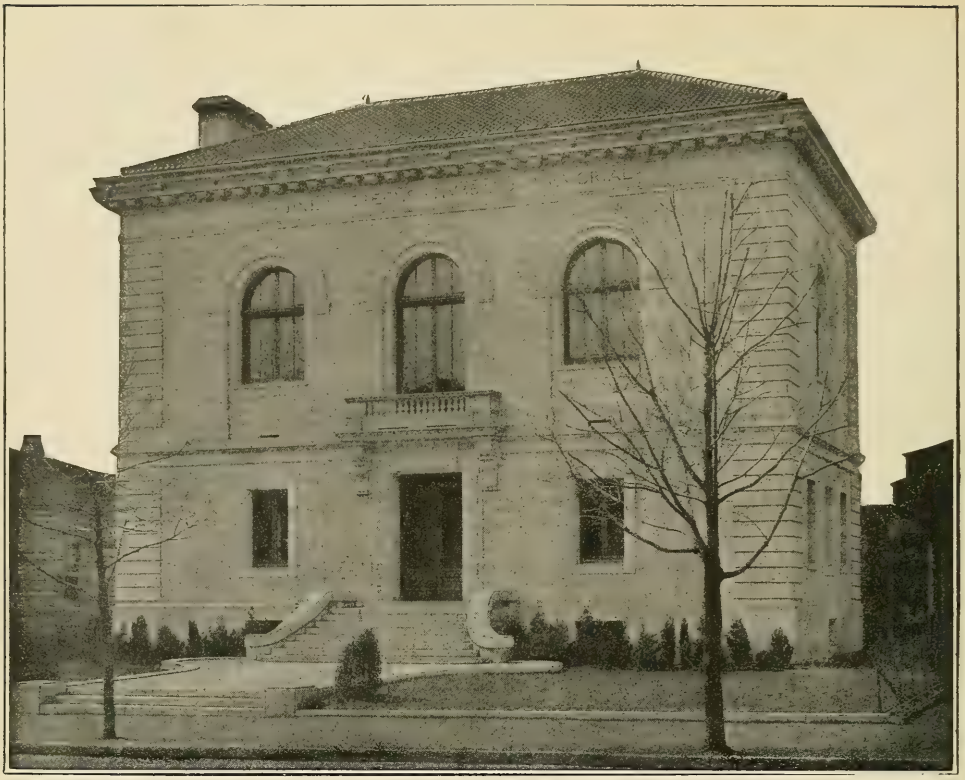

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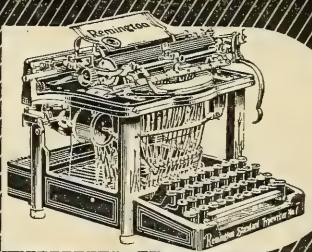

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SUPPLEMENT TO THE NATIONAL GEOGRAPHIC MAGAZINE
(WASHINGTON, D. C.), AUGUST, 1906

COUNTRIES

ARGENTINA.—Principal products Wheat corn cattle sheep and wool the cattle and sheep ranking in importance in the South. Chief exported quality of Europe in and principal Railway miles of railway according to the latest official statistics 16 464 Imports 1914 $313 000 000 exports $354 812 000 Area 1 135 840 square miles population 6 784 000

BOLIVIA.— Principal products Wheat coffee and rubber Rubber is the chief item in the export trade of Bolivia at present Bolivia is one of the most important countries of South America in the production of rubber Imports 1913 $1 200 000 exports 1913 $1 800 000 Area 514 000 square miles population 1 815 000

BRAZIL Principal products Coffee India rubber cacao cotton sugar cane tobacco rice corn a large proportion of the world's supply of coffee being grown Imports 1913 $160 000 000 exports $197 000 000 Railways 15 618 miles Area 3 218 000 square miles population 21 000 000

CHILE Principal products Wheat corn wine barley potatoes and products of the sea Specially copper nitrate and iodine are the mineral products exported Imports 1913 $93 000 000 exports $110 000 000 Railways 4 000 miles Area 289 000 square miles population 3 712 000

COLOMBIA Principal products Wheat coffee sugar cane rubber tobacco cotton corn cattle and gold Gold is the chief mineral product Imports 1913 $15 000 000 exports $17 000 000 Area 513 000 square miles population 5 000 000 Colombia has been practically at war with Panama since the revolt of the latter country in 1903

ECUADOR.—Principal products Cocoa coffee Panama hats rubber sugar cane cattle and gold Imports 1913 $6 000 000 exports $11 000 000 Area 116 000 square miles population about 1 400 000

GUIANA BRITISH Principal products Sugar rice coffee cocoa rum molasses and balata gum Imports 1913 $7 000 000 exports $8 000 000 Area 109 000 square miles population at last census 278 328

GUIANA DUTCH Principal products Sugar corn coffee cocoa rice bananas and rum Imports 1913 $2 500 000 exports $2 500 000 Area 46 060 square miles population 75 291

GUIANA FRENCH Principal products Rice corn cocoa coffee sugar hides tobacco gold silver and phosphates Imports $2 500 000 exports $2 400 000 Area 30 500 square miles population 23 000

PARAGUAY.— Principal products Cattle horses sheep tobacco yerba mate (or Paraguay tea) coffee oranges and fruits Railways 150 miles Imports $3 441 000 exports $3 817 000 Area 142 000 square miles population 630 000

PERU.— Principal products Cotton sugar cane coffee tobacco wheat cotton clothing wheat corn cattle gold silver and other minerals Railways 1 146 miles Imports 1913 $18 000 000 exports $19 700 000 Area 697 573 square miles population 4 610 000 (estimated)

URUGUAY.— Principal products Wheat corn cattle horses sheep wool wine tobacco gold silver and coal Railways 1 710 miles Imports $21 238 000 exports $30 764 000 Area 72 210 square miles population 978 000

VENEZUELA Principal products Sugar coffee cocoa corn cattle India rubber vanilla beans gold silver copper pearls sponges and tortoise shells Railways 638 miles Imports $5 425 000 exports $7 813 000 Area 593 940 square miles population 2 445 000

Vol. XVII, No. 8 WASHINGTON August, 1906

THE NATIONAL GEOGRAPHIC MAGAZINE

SOUTH AMERICA FIFTY YEARS HENCE

By Charles M. Pepper

Author of "Panama to Patagonia," "Tomorrow in Cuba," etc., Member of Permanent Pan-American Railway Committee

In the first Pan-American Conference, which was held in Washington in 1890, one of the most eminent of the delegates from Latin America declared that the 20th century would belong to South America, just as the 19th century had belonged to the United States. This sentiment will be re-echoed by the Third Pan-American Conference during the sessions at Rio Janeiro. In the meantime Canada has come forward with rapid strides, and Premier Laurier asserts that the 20th century belongs to Canada.

In the opinion of many people in the United States, though they know almost as little of Canada as of South America—that is, of the splendid domain which stretches from the maritime provinces to the Pacific and the regions of the Yukon—the Dominion has the better claim. But it is not necessary to quarrel with either prophecy. Both have vast possibilities.

With regard to South America, it may still be difficult to convince North Americans that this continent, whose area comes within a fraction of equaling North America, has a future which should not be measured by the past; or that fifty years hence it will not continue to be the region best known to the rest of the world as the seat of earthquakes and revolutions. There is no need to enter here into political abstractions or theories which involve the political future of the Southern Continent. In a half century from now, looking backward, it may be interesting to see how speculative principles have yielded to hard economic facts. The point for the present is that South America has a future which is just becoming known to itself. In all its possibilities, industrial and political, this may be described as a geographic future, and the geography is commercial rather than political geography.

The influence of the physical aspects of the continent always must be considered in relation to South America as a whole. The 16th-century idea that the precious metals constituted the principal wealth of a nation has been very slowly dissipated. The mineral resources of the Andes and of the other mountain systems of South America will continue a very potent incentive during the next half century, but the greater development is going to come from supplying what mankind eats and wears. South America's

productive resources must be considered in relation to the world's cotton crop, wool clip, cereal products, coffee crop, sheep and cattle, and rubber. Thus the Amazon forests, the Brazil coffee plantations, the Argentine wheatfields and grazing ranges, and the Chilean nitrate beds are all to be considered, as well as the mines of Bolivia and Peru.

Some epoch-making economic events will mark the coming half century. There will be an overflow of capital from the United States, and this will be an enormous factor in securing the development of the various countries. Up to this time our capital has been so fully employed at home that it could not be induced to venture abroad. Now a new condition, fully recognized in the circles of high finance, though not appreciated by the people at large, is arising, and this new condition is marked by the investment of large sums of money in railway and similar construction enterprises as well as in mines. These investments are tentative and preliminary, but they recognize the growing necessity of finding an outlet for redundant funds in the South American field.

There is also, of course, the Panama Canal, which has incalculable possibilities for the west-coast countries without in any way impairing the growth of the Atlantic regions.

North Americans are more familiar with the Atlantic coast, and for various reasons those countries already have shown the most marked progress; but the general line of development during the next fifty years may be described as inter-South American and not restricted to any one region.

THE BUILDING OF RAILWAYS

It was just about half a century ago that the South American countries began to build their first railways. The Argentine Republic in 1907 will hold a railway exposition at Buenos Aires to commemorate its first railroad, which was a short and unimportant one. Brazil started its lines somewhat later, while on the Pacific coast there were various schemes for piercing the Andes. One of the first railroads constructed in South America was in southern Peru, from Arica to Tacna, and the prediction was that it soon would cross the volcanic coast Cordilleras and reach the great central plain of Bolivia. Another line was from Valparaiso and Santiago right to the mountain wall of the Cordillera, and this was expected to bore its way through and reach the pampas of Argentina. But half a century passed and the Andes wall was still unconquered and the skeptics renewed their doubts whether it ever would be pierced.

On the Atlantic slope the engineering difficulties were not so great and both Brazil and Argentina from year to year spread out their systems of railways; yet, considering the resources of the regions to be developed, these extensions were not up to expectation, and the prophets of doubt again raised their distressed voices. Prophets of this class, however, lacked the sense of proportion and failed to note the really remarkable development that had taken place. Few of them yet have an idea of the enormous foreign commerce that has been developed by the Atlantic coast countries, which now reaches approximately $800,000,000 annually and soon will be $1,000,000,000.

THE DEVELOPMENT OF BRAZIL

It may be that fifty years hence northern Brazil—that is, the torrid region of the Amazon—will not have a notably greater population or a greater commerce than now exists, for much of that vast basin is not a white man's country and is not susceptible of permanent settlement by the Caucasian races. It is fifty years since Alfred Russell Wallace wrote his fascinating description of life on the Amazon, and in another fifty years the civilization may not be markedly different. It is even possible that in another half century the increasing appetite for crude rubber will have caused the gum forests to be depleted almost completely; yet the measures adopted by the Brazilian

government for preserving this industry and for encouraging new cultivation are taken especially with a view to fifty years and a century hence. So it is more probable that Para, at the mouth of the Amazon; Manaos, the fluvial capital; and Iquitos, the Peruvian rubber metropolis, to which Commander Todd, of the United States Navy, took the *Wilmington* a few years ago, will show a growth proportionate to that of the last half century. In the case of Iquitos the half century cannot be taken as the measure mark of growth, since its existence only dates back a quarter of a century.

With Brazil the greatest development is more likely to be in the semi-tropical and the temperate regions in the southern part of its extensive territory. No reason exists for imagining that in half a century the country's position as the chief source of coffee production will be altered, and there is cause to believe that vast cotton plantations also will exist; but the more rapid growth will be in the states of southern Brazil where the cereals are raised. Brazil is so vast and, except on the fringe of coast, is so undeveloped that it is difficult to guess at this period how far the development will advance inland. It may not progress very far in fifty years, and yet, with the very large area which is contiguous to the coast, even a relatively slight growth would add very materially to the productive resources and the commercial opportunities of the country.

There is almost a certainty that a phase of development which follows the line of least resistance will be realized within the next fifty years by the construction of a railway trunk from Pernambuco to the border of Uruguay. This is the grand conception known as the Interoceanic Railway, whose ultimate purpose is to place Pernambuco in through railway communication with Valparaiso on the Pacific, traversing a total distance of approximately 4,000 miles. The sections through other countries may be overlooked temporarily and this proposed trunk line be considered with reference to Brazil alone. It would run from Pernambuco along the course of the San Francisco River, forming a northeast and southwest artery, giving several Brazilian states needed railway communication by branches and by crossing the systems of the states of Bahia, Minas Geraes, San Paolo, Parana, and Rio Grande do Sul. The distance from Pernambuco to the border of Uruguay is 2,800 miles and the technical conditions for railway construction are not difficult. The Brazilian government gave the project its indorsement fifteen years ago, and some preliminary studies and surveys of the route have been made. It may lie dormant for a quarter of a century or more, or it may be taken up within the next ten years, but it is certain to come within the next half century and to add enormously to Brazil's development, both in population and in production and commerce.

THE GRANARY OF SOUTH AMERICA

The Argentine Republic is best known of all the South American countries because it produces cereals and beef, mutton, wool, and hides in competition with the United States, Canada, and European countries; yet it is difficult to keep pace with the enormous growth of Argentine agriculture during the last few years, just as very many persons are still unable to grasp the fact that instead of being a little country somewhere down in South America it is 28 times the size of Ohio, and that while in the northern regions it produces sugar and other tropical products, yet as a whole it is to be viewed as another Mississippi Valley. The Argentine Minister of Agriculture estimates the wheat crop for the current year at 3,882,000 tons, the area under cultivation being 14,028,000 acres. The foreign commerce this year will exceed $550,000,000.

The population of the country is not in excess of 5,250,000. Argentina easily has room for 50,000,000 inhabitants. I don't pretend to say that it will have 50,000,000 or anything like that number fifty years hence; yet there must be an

appreciable growth, for the country can sustain a dense agricultural population from its northern border clear down through Patagonia, and settlements will spread through all those regions. Buenos Aires in 1856 had 100,000 inhabitants; today it has more than 1,000,000. It is no wild flight of fancy to prophesy that in another fifty years its population will be 2,500,000, and that on the Southern Continent, 2,000 miles south of the Equator, there will be a city which may not be exceeded by more than two cities in the United States.

In considering the industrial and commercial South America of fifty years hence as relates to the Atlantic coast, it would be better to disregard the lines formed by the boundaries of countries and to consider Argentina, Uruguay, southern Brazil, and part of Paraguay as one section, for in this region are the enormous productive resources which constitute it the world's granary, that will be drawn upon as rapidly as the United States and Canada require their own agricultural products for home consumption. The statistics of agricultural output for this central region will be the measure of growth. Another means of measuring it will be the shipping statistics of Buenos Aires and Montevideo.

THE WEST COAST COUNTRIES

I have had opportunity to consider recently in a separate volume* the economic effect of the Panama Canal on the west-coast countries of South America, and also have had frequent occasion to outline the possibilities of the Pan-American Railway project. For that reason I shall give these subjects only brief consideration here, starting with the premise that the railways will spread across the Andes and make some of the regions on the eastern side tributary to the west coast. In stating that the efforts to pierce the Andes from Tacna and Valparaiso did not come up to the expectations of a half a century ago, I neglected to add that the beginning of the present fifty-year period will be marked by this through communication. The trans-Andine tunnel through the Uspallata Pass from the Chilean side to the Argentine side at Mendoza will be completed within less than three years, and the railway from Arica and Tacna to La Paz, in Bolivia, will be finished within four or five years. These results are to be accomplished under contracts already let.

In the Intercontinental or Pan-American Trunk Line project undoubtedly there will be long halts before all the gaps in such sections as those between Cuzco, in Peru, and Quito, in Ecuador, are completed; but all this is easily within the vista of half a century. The spell of the Inca civilization may come over the railway builder in Peru, but from the ruins of that civilization he may take lessons in road construction which can be applied to railway lines.

It is an engaging theme to inquire whether, in addition to the coast development, within half a century the heart of South America will really have the arteries of commerce pulsating through it. Now Bolivia, in the Andes, may be considered as the heart of South America. Here, too, there have been projects almost half a century old for opening up this great interior to the outside world. Thirty years ago Colonel George Earl Church, one of the most distinguished of American civil engineers, entered heartily into the project of railway building in connection with river navigation, which was to insure the through route to the Atlantic by way of the Amazon and its affluents. The plan went down in disaster due to financial and other reasons. But today Bolivia has the assurance, probably within ten years, of railway outlets to the Pacific at Arica, at Mollendo, and probably at Callao, while on the Atlantic side there is the certainty of reaching the Plata at Buenos Aires through the connection with the Argentina systems, and a later possibility of reaching the Atlantic through Paraguay.

For the Amazon there is also now the

*Panama to Patagonia.

certainty of realizing Colonel Church's plan, for the Brazilian government will be impelled by the outlets Bolivia is securing in other directions to build the long-deferred railway around the falls of the Madeira to Santo Antonio. It already has made financial provision for this purpose just as Bolivia has made provision by contracts signed within the last few months for the connection of a series of links from Laka Titicaca to the border of Argentina, and also to Puerto Pando, on the Beni River, which is the beginning of navigation to the Amazon. At the very farthest, the opening up of this heart of South America may be placed at a quarter of a century instead of fifty years hence.

THE NETWORK OF RIVERS

There is another phase of river transportation which undoubtedly will be considered within the next fifty years. General Rafael Reyes, the President of Colombia, in his explorations showed the possibility of interfluvial communication through all South America. Other explorers and writers have advanced various propositions for bringing the Mississippi Valley, through the mouth of the Mississippi, and the immense interior of South America, through the mouths of the Amazon and the Orinoco, into more direct communication. It is very fascinating to think of sailing from New York or New Orleans up the Orinoco or the Amazon, and thence in smaller boats, and even canoes, with an occasional portage, dropping down to Buenos Aires. Fifty years hence it is quite probable that the canal, of less than 1,000 feet in length, which the early Portuguese explorers proposed from the headwaters of the Guapore, the largest affluent of the Madeira, in the Brazilian state of Matto Grosso, to connect with the streamlets Aguapey and Estiva, which empty into the Jauru, a tributary of the Paraguay, will be completed and a through means of navigation be obtained. The Portuguese made this canoe voyage without much portage. Some years ago, in Rio Janeiro, I saw the plans for the modern canal connection, and they appeared not only feasible in the engineering sense, but practicable in the commercial view. Yet this general fact is apparent—water transportation by means of inland rivers never reaches its full utility until the railway systems begin to spread a network among the river courses; nor do colonization and immigration follow upstream. There are numerous regions in South America easily accessible by river navigation, yet the efforts to plant colonies at their headwaters have failed. When the railway begins to creep along, then the people appear.

IMMIGRATION VERY NECESSARY

The whole question of immigration has to be considered in discounting the South America of fifty years hence. The movement has been very slow, and even with the better government which is now assured in most of the South American countries, it is not likely to keep pace with the needs of production; yet in time it will be secured, and probably there will be a notable movement within the next few years to Argentina, Uruguay, and southern Brazil, and later to the inter-Andine regions.

It must follow, if the development which is to show that the South America of fifty years hence has made much greater progress than during the preceding half century does not prove an illusion, that the minor streams of immigration will turn into currents. The native Indian stock of the South American countries must be overlapped. The South America of the middle of the 20th century will be less Spanish also, though possibly not less Latin, for one of the great sources of immigration which is peopling Argentina and some sections of Brazil is from Italy. The Panama Canal is likely to bring this element around to the west-coast countries. The northern races—Scandinavians, Germans, and natives of the British Islands—will find much larger areas of settlement than heretofore they have cared to seek. The

Scotch sheep herders already have taken very kindly to Patagonia, while Welsh and Russian colonies also are established in that region. It may even be that from the United States there will be some overflow of our own cosmopolitan population, though the direct ocean routes cannot be changed and Argentina and Brazil must continue closer to Europe than to the United States.

In conclusion, viewing South America fifty years hence, both in relation to the productive regions which will attract immigration and to the conditions of life which insure a permanent population, it may be said that the star of empire takes its way south from the Caribbean to Patagonia. That is the course for the grain-raiser, for the wool-grower, and for the grazer. It is also the course for the miner who follows the trend of the Andes.

A NEW PERUVIAN ROUTE TO THE PLAIN OF THE AMAZON

By Solon I. Bailey

Associate Professor of Astronomy, Harvard College Observatory

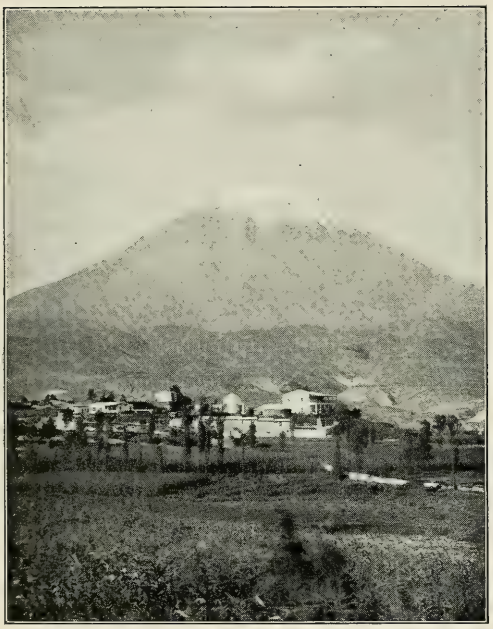
The author of this article was sent to the west coast of South America in 1889 to determine the best site for the Southern station of the Harvard College Observatory. He examined the west coast from the Equator to the southern coast of South America, and upon his report Arequipa, Peru, was selected. Professor Bailey had charge of the work there for eight years, and also established a meteorological station on the summit of El Misti, at an elevation of 19,000 feet, where observations have since been carried on. It is by far the highest scientific station in the world.

A COMMERCIAL conquest of the heart of the South American continent is going rapidly forward. While the coast regions have been settled and civilized for centuries, colonization has hardly touched the great plains of the upper Amazon and the lower valleys of the eastern Andes. Only yesterday, indeed, this vast region was almost unknown; today little remains which has not been at least partially explored. Nor is it now any thought of the millions who in the future may here make their homes which is working for the development of the country, but simply the desire to be first in the exploitation of its natural wealth, especially rubber.

Commerce naturally follows the lines of great rivers, and nowhere else are there such vast water systems as in South America; nor does it seem improbable that the same law will hold true here, especially after the possibilities of the tributaries of the Amazon have been properly developed, and that the commerce of southeastern Peru and Bolivia will find its way to the Atlantic, thousands of miles distant, rather than to the Pacific, only a few hundred miles away. This has been true in the past, and is strikingly illustrated by Iquitos, in northeastern Peru, which is practically an Atlantic seaport, although in Peruvian territory and 2,000 miles from the mouth of the Amazon. From southeastern Peru and Bolivia, however, in the regions of the Madre de Dios and the Beni, communication with the Atlantic is more difficult. This is due especially to the falls of the Madeira, near the junction of the two rivers named above. These rapids block navigation at a distance of 2,000

Arequipa, the Chief City of Southern Peru

miles from the mouth of the Madeira. Above the falls steamships may again be used; but the danger and loss in passing the rapids are so great that, until this difficulty is overcome, another route is very desirable. The Pacific is comparatively near, but a journey must be made through dense forests and wild gorges to the crest of the eastern Andes and down to the Titicaca Plateau, where railway transportation to the Pacific is ready. Until recently no direct route had been opened up.



Peruvian Station of Harvard College Observatory, near Arequipa

Altitude, 8,000 feet. In the background rises the nearly extinct volcano, El Misti, 19,000 feet high. On its summit a meteorological station was maintained for eight years.

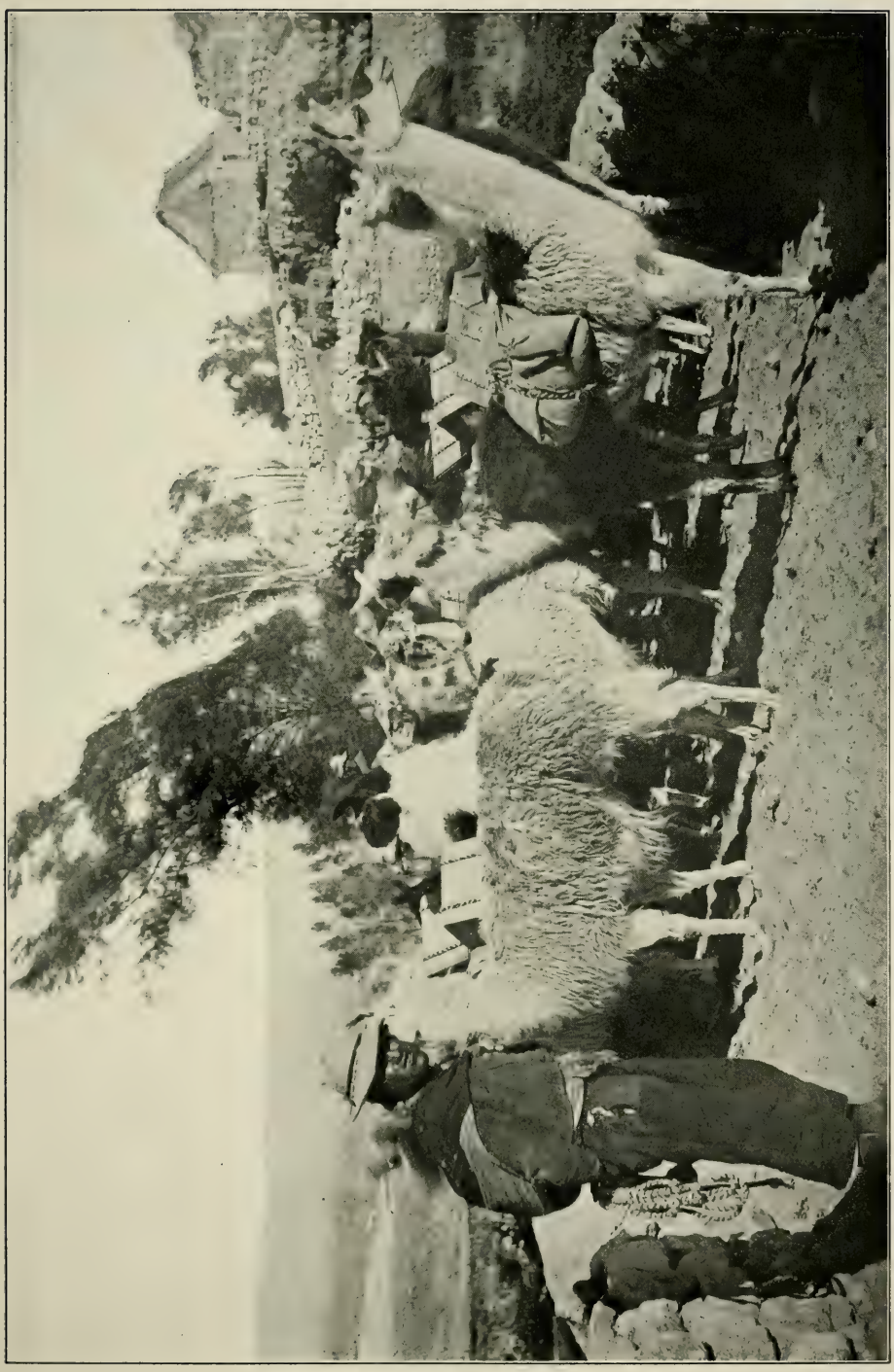
At the present time there are several ways of reaching the Madre de Dios and its tributaries, but the most direct and comfortable route is that which I traversed in 1903 before its completion. Since that time many improvements in the road have been made.

From New York one may reach the Peruvian port of Mollendo in about three weeks. At the present time it is necessary to cross the Isthmus of Panama by rail, but when the canal is completed through steamships from Atlantic cities will doubtless call at all important South American Pacific ports. From Mollendo a railway journey of seven or eight hours takes one across the desert to Arequipa, the chief city of southern Peru. Arequipa lies on the western slope of the Andes, at an elevation of 7,500 feet. This elevation within the tropics furnishes an almost ideal climate. The whole region west of the Andes in Peru is, however, desert and capable of cultivation only by irrigation. Arequipa owes its existence to the small River Chile, whose waters are exhausted in irrigating the valley which surrounds the city.

A railway leads from Arequipa to the Titicaca Plateau, which lies between the eastern and western Andes. On the lofty and desolate Puna it reaches an altitude of 14,660 feet before it descends to the plateau. Lake Titicaca has an elevation of about 12,500 feet. This great region between the different ranges of the Andes was the home of the various Indian races that under the domination of the Incas made up the semi-civilized population at the time of the Spanish conquest. Their descendants, for the most part full-blooded Indians, still dwell on the same plateaus and lofty valleys, but in a low social condition. They have lost rather than gained by the coming of a higher civilization.

CROSSING THE ANDES

At Tiripata, on this plateau, it is necessary to leave the railway and cross the eastern Cordillera. Through American enterprise, in connection with an enlightened policy on the part of the Peruvian government, a wagon road has been constructed for a portion of the route across the plateau, and will



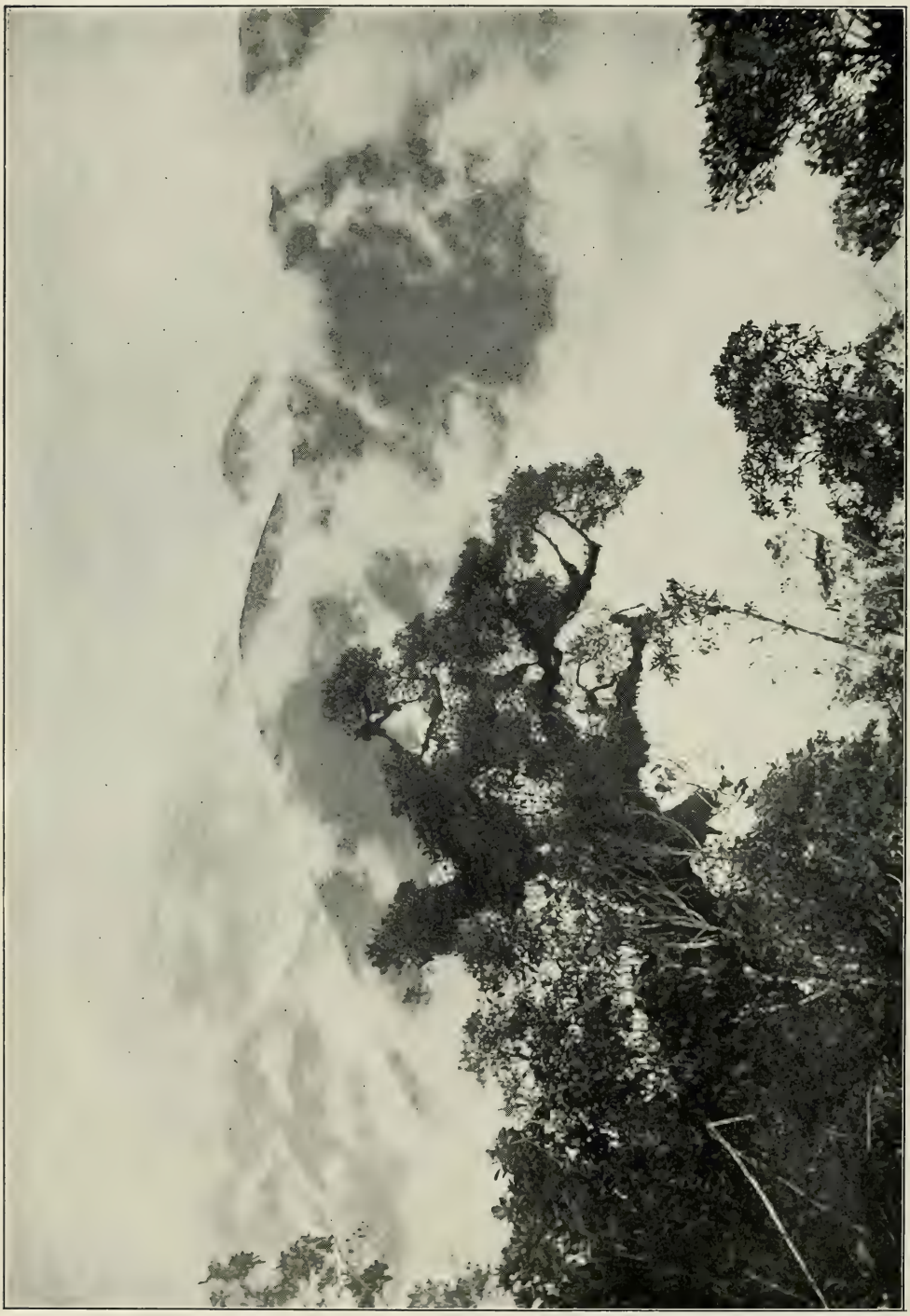
Group of Llamas and Their Indian Drivers from the Titicaca Plateau

Lake and Glacier in the Aricoma Pass of the Eastern Andes

Altitude of the pass, 16,500 feet

Mule Trail of the Inca Mining Company, Eastern Slope of the Andes

In many places this trail passes along the side of a perpendicular cliff, several hundred feet above the river



Among the Eastern Foothills of the Andes, a Region of Almost Perpetual Cloud and Rain

be carried over the mountains to a small Indian town on the eastern slope. From this town a good trail for miles will be built, down to some navigable river on which small steamers can be used. With the railway most of the comforts of civilization are left behind. In four or five days of mule-back travel we mount the eastern Andes, winding our way through the Aricoma Pass at an altitude of about 16,500 feet. Here the scenery, if the weather is fine, repays the hardships of the trip. Snowy mountains and enormous glaciers are mirrored in the waters of lakes, which change their colors with every whim of cloud and sky. More often, however, the traveler is wrapt in blinding snowstorms, which shut out every glimpse beyond the narrow limits of a few feet. Hour after hour he clings half frozen to his mule, his discomfort heightened by the mountain sickness, which is one of the terrors of these lofty regions. To lose his way under these conditions may mean death.

On reaching the eastern crest of these mountains, if the view is clear, one seems to be standing on the edge of the world. The eye, indeed, can reach but little of the vast panorama, but just at one's feet the earth drops away into apparently endless and almost bottomless valleys. We may call them valleys, but this does not express the idea; they are gorges, deep ravines in whose gloomy depths rage the torrents which fall from the snowy summits of the Andes down toward the plain. We might hunt the world over for a better example of the power of running water. The whole country is on edge. Here all the moisture from the wet air, borne by the trade winds across Brazil from the distant Atlantic, is wrung by the mountain barrier and falls in almost continual rain.

Near the summit of the pass only the lowest and scantiest forms of vegetable life are seen. In a single day, however, even by the slow march of weary mules, in many places literally stepping "downstairs" from stone to stone, we drop 7,000 feet. Here the forest begins, first in stunted growths, and then, a little lower down, in all the wild luxuriance of the tropics, where moisture never fails. The lower eastern foot-hills of the Andes are more heavily watered and more densely overgrown than the great plain farther down. Here is a land drenched in rain and reeking with mists, where the bright sun is a surprise and a joy in spite of his heat. In these dense forests, with their twisting vines and hanging lianas, a man without a path can force his way with difficulty a mile a day.

In these foot-hills, at an elevation of 4,000 or 5,000 feet, is the Santo Domingo mine. Here is an American colony provided with comfortable, almost luxurious, dwellings, which are flanked by the unsightly huts of native miners and Indians.

From this abode of comparative luxury we again started mule-back along a new but splendid trail down into the "rubber country." Four days of this travel, through forests peopled with nothing more frightful than jaguars and monkeys, brought us to the end of the trail. Day after day ten hours a day in the saddle is sufficiently tiresome, but it was with regret that we left our animals to try the forest afoot. Our first experience involved only a walk of a couple of hours, but over a trail so narrow, steep, and blocked with trees and roots that we were soon exhausted. We were glad enough to arrive at a clearing on the bank of a recently discovered stream called the New River. After a delay of a day or two at this post, we made our way down stream a few miles to the junction of the New River with the Tavora, on whose waters we intended to embark. Six hours of walking over a path known in the picturesque language of my companions as "A hell of a trail" brought us to the junction, where we found another camp with a group of workmen of various nationalities.

THROUGH AN UNKNOWN COUNTRY

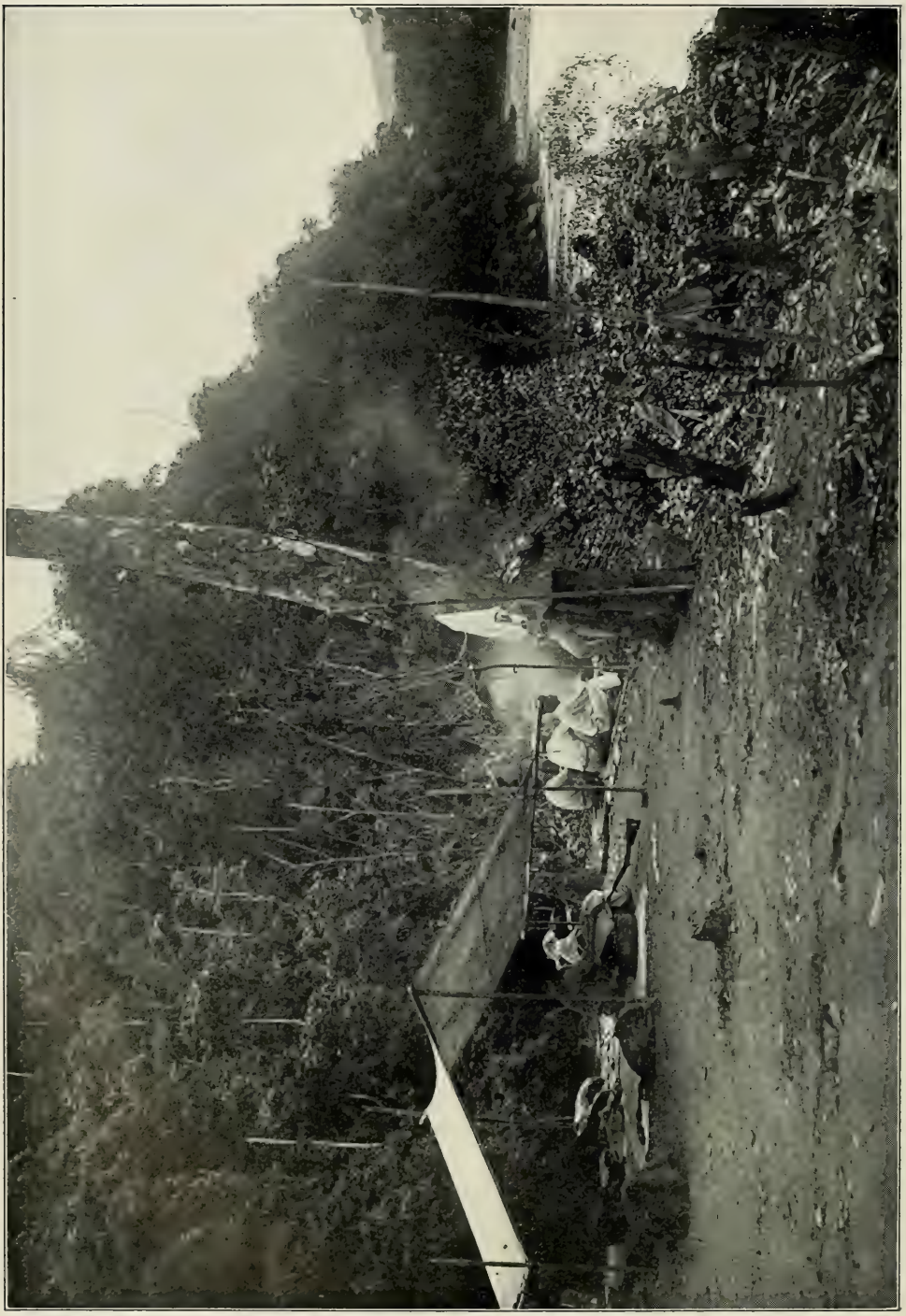
The party which I joined for the trip down the rivers was under the direction of Mr Chester Brown, the general manager of the Inca Rubber Company. To him and to his genial brother "Fred" I am indebted for some of the most interesting experiences which the present day furnishes. The route we took to the Madre de Dios had been traversed but once previously by a white man, and then only a few weeks before by an engineer in the employ of the company. At the place where we embarked on the River Tavora we were still well up among the foot-hills of the Andes, and navigation, even in canoes and rafts, was attended by many difficulties and some dangers, owing to the numerous rapids.

The canoes are dugouts shaped from a single log. They are from twenty to twenty-five feet long, two or three feet broad, and readily carry half a dozen men and several hundred pounds of freight. For the passage up-stream only canoes are used, and they are propelled by paddles or by poles, according to the depth and swiftness of the water. For the journey down the river, however, rafts are also used, since the rapid current renders great exertion unnecessary. Many of the native woods are too heavy for rafts; indeed, a number of varieties sink at once, so great is their specific gravity. The variety used for rafts is nearly as light as cork. A number of logs of this raft-wood are fastened together by driving through them long wood pins, made of a kind of palm which is so hard that it takes the place of iron. Cross-pieces are then fastened on in the same way, and the front end is made pointed, so that the craft shall not be stopped by collision with driftwood or boulders. When finished the raft consists entirely of wood, and no tool has been used in its construction except an axe.

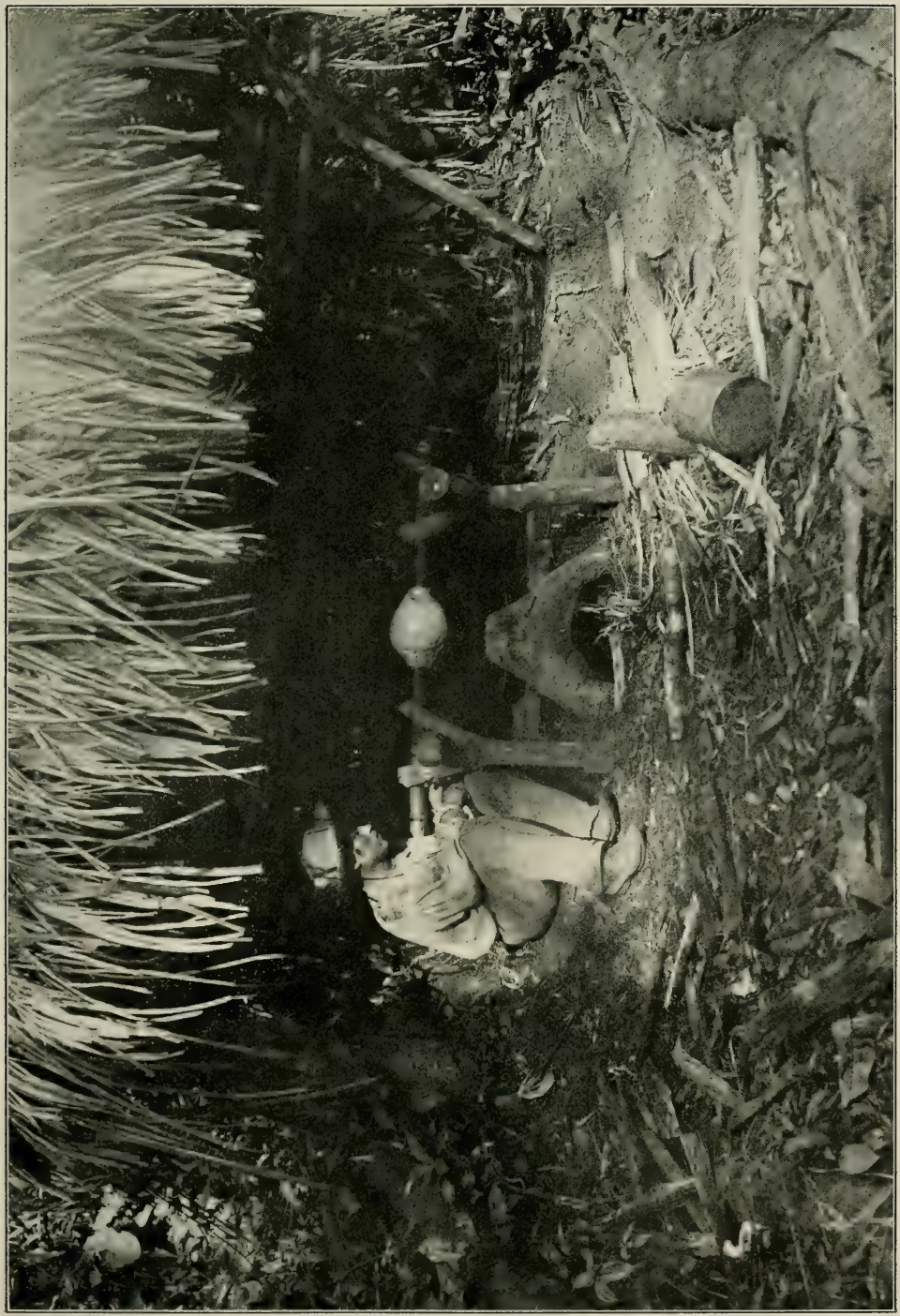
With two rafts and two canoes, our party set out one day about noon. The trip began with the running of a swift rapid, which was one of many to follow. The canoes generally led the way and pointed out the best route. In many cases there were sharp curves, with here and there the stranded trunks of great trees and huge boulders. Many of our experiences were sufficiently exciting, and a fall into the river was a common incident of the trip. Our company included a crew of ten men, a motley crowd of various colors and nationalities. A nearly continuous stream of profanity attended the various maneuvers of our fleet, which reached its climax in intensity and picturesqueness when some sudden jar projected one or more of the boatmen into the water. At such times familiarity with the language of the boatmen would have been a misfortune. In the swifter and shallower rapids of the upper streams it was often necessary to lighten the load by wading in the water beside the canoes, which were guided by hand or even by a rope carried along the bank. This sort of travel, together with frequent rains, caused all the party to be soaked with water from morning to night, and we were fortunate when the kits were kept dry, so that the night could be passed in comfort. At one time during the expedition rain fell in prodigious quantities, causing the river to rise nearly ten feet within twenty-four hours. Progress became difficult and extremely dangerous, owing to the swiftness of the current and the trunks of trees carried along on its surface. We were obliged to make camp and wait. This we did at a place which seemed sufficiently elevated above the surface of the river. The following night, however, the water reached our camping ground and compelled us to change quarters in the darkness. Pitching a new camp at midnight, in a tropical jungle, in a pouring rain, is a far from cheerful occupation.

The Tavora, a river found on no map yet published, is one of the branches of the Tambopata, a stately stream but

A Rubber Tree



A Camp in the "Rubber Country"



Curing Rubber by Smoking It. A Native Hut, Eastern Peru

Natives Living on the Tambopata River, a Tributary of the Amazon

little known. The Tambopata is a tributary of the Madre de Dios, which joins its waters with those of the Beni and other rivers to form the Madeira. The Madeira is one of the great rivers of the world, and yet it is only one of the sources of the mighty Amazon.

Until our embarkation we had been continually in deep, densely wooded valleys, our view always shut in by their lofty sides. On the second day down the Tavora, however, as we swept out into the broader waters of the Tambopata, the hills fell away suddenly, leaving before us only the level Amazonian plain—one vast forest, extending unbroken, save for the river courses, for hundreds, even thousands, of miles. At rare intervals the banks rise in bluffs fifty or a hundred feet above the general level, but usually it is an unbroken, forest-covered plain, rising only a few feet above the level of the river, and in time of flood covered for great distances by the swollen waters. It is a forest, so far as I saw, without a single natural opening or glade, except along the banks of the rivers. For days we had longed to see the hills melt away and the plain appear; a month later, while working our slow way up the river, we watched with even greater eagerness to catch again a glimpse of the blue hills outlined against the sky.

THE CHUNCHOS

In the shade of this ever-present

The Peruvian Military Camp near the River Madre de Dios

forest live various groups of savages, known as *Chunchos*. They dwell in general along the banks of the rivers, and indeed they seem almost as much at home on, or even in, the river as on the land. The reputation which they enjoy is none of the best. We met half a dozen groups during our expedition, some of whom apparently had never before seen white men. They impressed me as simple and well-disposed, if treated fairly, and surprisingly intelligent. Indeed, several times while attempting to converse with them by means of signs I could not resist the impression that they were merely masquerading under the guise of savagery. From almost every standpoint, however, they are mere savages. They are nomadic, roaming up and down the rivers and building only the rudest huts. They have no metal implements, so far as I could learn, and few, if any, made of stone. Some of them appear to have no proper household utensils, and such scant pottery as I saw was very rude. Their clothing is made of the fibrous bark of a certain tree, called by them *Ianchama*. This is stripped off in large pieces and pounded on flat stones with great patience until the coarser materials are removed and only the inner, tough, but rather soft and pliable, bark is left. This resembles in texture a coarse cloth. Two pieces of this material are sewed together to form a sleeveless shirt which reaches from the shoulders to the knees. Shawls and loin-cloths are also made from the same bark. These garments are not always worn, however, for when we approached a village unannounced both men and women completely nude were sometimes seen.

Their ideas in regard to propriety were satisfied by a loin-cloth, and several young women of modest mien and rather dignified presence stood and at-

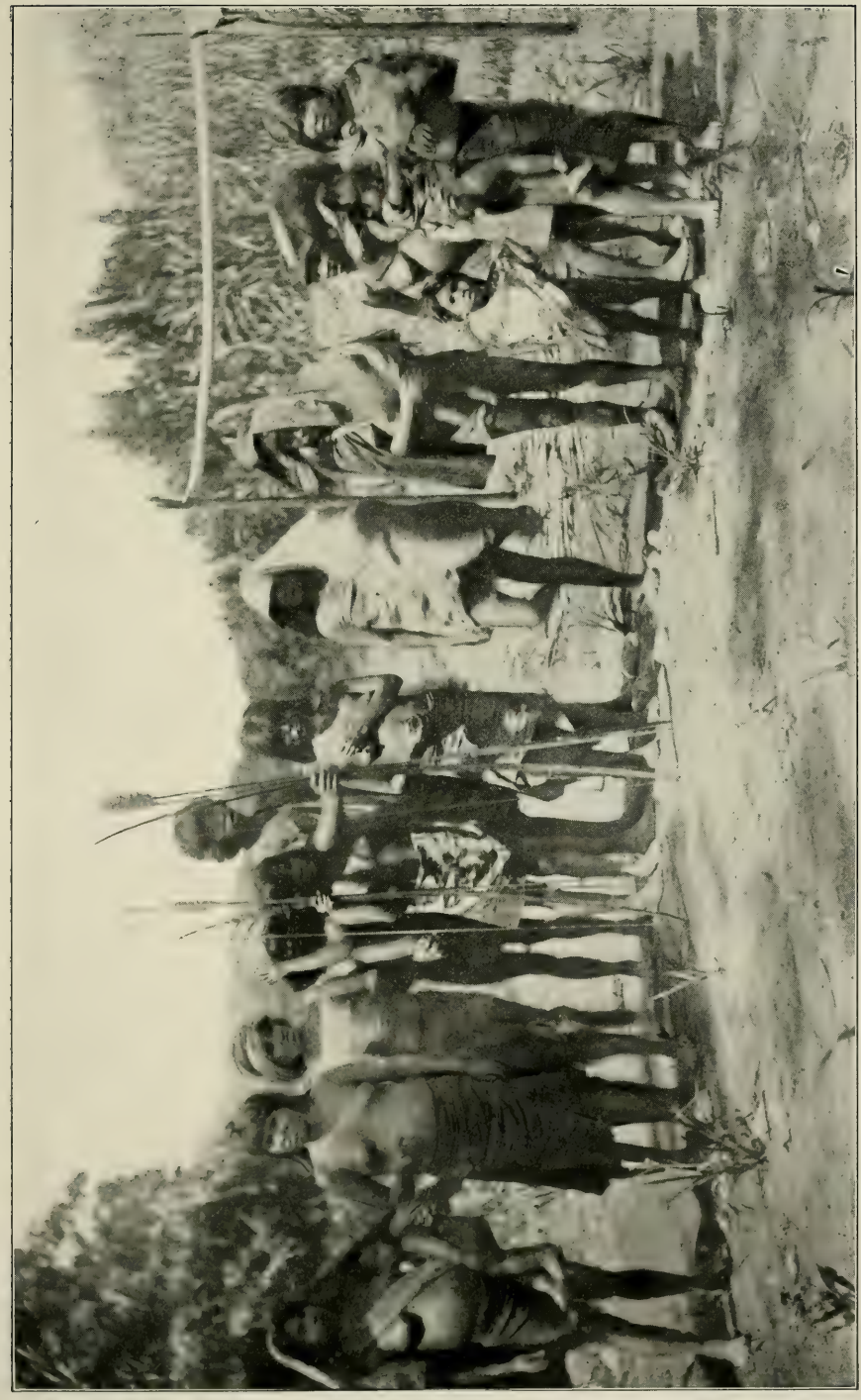
tempted to talk with us dressed in this fashion. Another girl, without the slightest suspicion in her manner of any impropriety in the act, removed the shirt she was wearing in order to exchange it for one made of cloth offered to her by a member of our party. The Garden of Eden still lingers here. These Amazonian Eves have evidently never heard of The Fall. Like other people, however, they take pride in dress. Jewelry also is worn, made of the teeth of monkeys or of pretty shells. Nose ornaments are worn, which no doubt add some charm for Chuncho eyes, but which are decidedly inconvenient when eating.

Insects are a great pest, even to these hardy children of the forest, who slip into the water frequently to be free from their stings and to cool themselves. Men and women, boys and girls, threw themselves into the water, unmindful of our presence, and swam about in unencumbered grace.

Food is abundant with them—plantains and yuccas, as well as game and fish. The weapons of war and those of the chase are much alike, consisting of bows, spears, and arrows, all made of an extremely hard variety of palm. With these they wage war on unfriendly neighboring tribes, and also hunt the tapir, deer, monkeys, wild turkeys, and fish. They roast the flesh of animals and fish, either by placing it directly in the fire or first inclosing it in hollow pieces of cane or bamboo. The heads of monkeys and of the larger kinds of fish seem to be regarded as dainties, and are simply placed in the fire and roasted or burned to the proper point. Monkey meat, when properly cooked, is palatable enough; but the appearance and manner of a large monkey is so human that when roasted and served whole it gives a cannibal air to the meat somewhat disagreeable to me. No such thought, however, comes to the Chuncho.

They have a curious combination of rather bright and "taking" ways and of low and filthy habits. Their continual bathing renders them free from personal unpleasantness, though it is doubtful if they enter the water with any idea of cleanliness. Their sense of humor is as quick as that of an Irishman. With no idea of our language, they seemed to catch a joke at once and were frequently laughing. This is in great contrast with the Indians of the Peruvian Plateau, who are slow in thought and movement and seldom laugh, at least in the presence of strangers. Many of the Chunchos whom we met apparently saw white men for the first time. Certainly no one of them had ever seen a bald man. One of our party was decidedly bald, and when he removed his hat a look of surprise and amusement passed over the faces of the whole group, accompanied by sly, if expressive, remarks. Freedom from the use of hats may account for the absence of baldness among them. It is an interesting fact, however, that among the different groups which we met, no person, man or woman, appeared to me over forty years of age. What became of the aged I could not learn.

I have never seen a more interesting affair than a luncheon which a party of Chunchos took with us on our way down the Tambopata. Our limited stores of provisions contained marvelous novelties for them. Sugar was quite unknown to them. Each took some in the palm of his hand and tasted it slowly and cautiously; then a smile of satisfaction lighted up his face, and the sugar disappeared. Men and women, impelled by curiosity, mingled freely and frankly among us, and although among themselves the women are probably accustomed to eat after the men, with us they all came together in apparent equality. For pickles they expressed great disgust. Tea was taken with indifference or contempt, but cocoa with plenty of sugar pleased them extremely. A little confectionery, in the form of rather solid balls, was eaten



A Group of Chuncho Savages on the Bank of the Tambopata

with emphatic nods of appreciation, with the exception of two or three pieces which one of them saved. He explained, by digging a hole in the ground and pretending to cover up one piece, that these were to be kept for seed, so that in the future they might have plenty of so delicious a fruit.

Of their religious life or the lack of it almost nothing could be learned from the bands we met along the Tambopata. At Maldonado, however, the newly established military post of Peru on the Madre de Dios, were two or three Chunchos from another river, who had become residents of the camp and had learned some Spanish. The commandant of the post and I spent some time trying to find out whether these savages have any idea of religion. The commandant, a good Catholic, attempted to explain to them some idea of God. They listened apparently in vague wonder, and when asked if their people had no such belief replied in the negative. The idea of a future life after death, so far as we could learn, was not familiar to them. At the present time there are several thousands of these savages living in scattered groups of twenty or more along the rivers flowing into the Madre de Dios. Many of them are just coming into intimate contact with the white race. A condition little better than slavery awaits them.

IS IT A WHITE MAN'S COUNTRY

For the present the chief interest in this great, undeveloped region lies in the fact that it is rich in rubber and a few other natural products. But what of its future? Is it "a white man's country?" Parts of it undoubtedly offer favorable conditions for white laborers, so far as climate is concerned. From the crest of the eastern Andes down to the level plains, every climate, from the frigid to the torrid, is passed in succession. This zone, however, is narrow and badly cut up into deep valleys with precipitous sides. Agriculture has its difficulties. It is stated that a farmer arrived one day at the Santo Domingo mine in very bad condition. Asked what had happened to him, he replied that the night before his farm had fallen on him. Landslides in this region are certainly frequent. Probably enough water power is going to waste on these slopes to do the work of the world. Within a short distance large streams fall in a continuous mass of foam 10,000 feet or more. Nor does it seem to me probable that the lower plains will be found especially unsuited to the white race. At present in these endless forests insects swarm in countless millions and malaria doubtless is prevalent; but, with the forests cleared away and with the comforts of civilization, the conditions would be much improved. The altitude is some 2,000 feet above sea-level and the heat by no means extreme. During our journey on the rivers the highest temperature recorded was 96° F., and a temperature above 90° was extremely rare. One hesitates even in imagination to picture what manifold industries may be found among these foot-hills in coming centuries, and what millions of prosperous dwellers may be clustered on the plains at their feet.

FROM PANAMA TO PATAGONIA

The following article is abstracted from "Panama to Patagonia," by Mr Charles M. Pepper, recently published by Messrs A. C. McClurg & Co., of Chicago. It is a very timely volume, filled with useful and interesting information about the west coast of South America. The quotations are copyrighted by A. C. McClurg & Co.

THOUGH it is desirable to know Spanish, which is the idiom of South America with the exception of Brazil, the chance traveler who wants to go down the coast, or even take an occasional trip into the interior, can get along with his stock of English. In all the seaport towns are English-speaking persons, merchants or others. On the ships English is as common as Spanish, and in some of the obscurest places the tongue of Chaucer may be heard. In one of the most out-of-the-way and utterly forsaken little holes on the coast I found the local official, who was sovereign there, teaching his boy arithmetic in English. He had been both in England and in the United States, and while his own prospects now were bounded by the horizon of the cove and the drear brown mountain cliffs that shut it in, he was determined that his son should have a wider future. There are also many young South Americans who have been educated in the United States and some of whom are met at almost inaccessible points in the interior.

CONSERVATIVE PERU

In Lima, Peru, the Italians are by far the most numerous among the Europeans. They have largely the retail trade and they are property-holders in an unusual degree. A Little Italy lies across the Rimac River.

A very large Chinese population exists in Lima. Much of it is the second and third generation. Originally the Chinese were brought to Peru as contract coolie laborers, but of late years the immigration has been of a normal kind. The Chinese of this period have discarded the queue and have adopted the conventional dress. Some wealthy Chinese merchants have an appreciable influence in the commerce of the country. China keeps a consul-general in Peru with semi-diplomatic functions, and usually he has enough to do.

Peru is almost exceptional among the South American republics for establishing and maintaining the gold standard. This is a brilliant and instructive chapter of financial history. The beginning was made in 1897, following the presidential election in the United States. General Pierola was president and was strongly in favor of the gold basis. Though Peru was a silver-producing country, a law was passed providing that gold should be the sole standard, that the customs duties should be thus paid, and that there should be no further silver coinage.

In the ten years following 1895 the banking capital of Peru increased at the rate of 150 per cent, while the deposit accounts ran up from $4,500,000 to $14,000,000. The banks pay dividends of 14 to 16 per cent. Volumes might be written about the causes which are leading to the commercial and industrial prosperity of the country and contributing to the political stability. The convincing evidence of the fact is the growth in the bank deposits.

VALPARAISO

Valparaiso (Vale of Paradise) is the largest place on the Pacific coast, with the exception of San Francisco, and it is equally as fine a metropolis. Its population is 140,000. The city lies at the foot of high hills, which no one climbs, because there are ascensors, or elevators, as in Pittsburg and Quebec. Unhappily it has not a Golden Gate and a sheltered harbor. The finest part of the city is the Avenida, or Avenue

Brazil, at once shaded boulevard, business thoroughfare, and promenade.

The city has many fine business blocks of modern construction and the government buildings are unusually tasteful and harmonious. All bear the impress of Italian architecture.

The port, as is natural, is cosmopolitan. The German colony is largest, and after that the Italian, in numbers, though in influence they are hardly so strong as either the English or the French. The French community is self-contained and is an important factor in commerce. The Britishers, chiefly from Scotland, are in everything except retail trade. Though the English language is common, Valparaiso is the one city in South America in which I heard German spoken oftener. The shipping of Valparaiso is vast and varied, a floating panorama of many nations, like a miniature Hamburg. The English lines maintain a regular fortnightly service of cargo and passenger vessels, and also a special service of cargo vessels to Liverpool. The steamers are of 5,000 tons and upward. The distance to Liverpool by way of the Straits is 9,500 to 9,800 miles, and the sailing schedule is 35 days.

The Bay of Valparaiso is a discouraging one. It is surprising that so extensive a commerce can be handled with such poor facilities. The shipping approximates 1,000,000 tons yearly. The engineering difficulties in the way of creating a real harbor are well understood, though not easily overcome. The rains wash the hills down into the sea, but the detritus, or silt, does not fill in what seems to be the bottomless bed of the ocean, so profound is it. There is no breakwater. At the beginning of every winter season the question is raised,What will be the harvest of the disaster? It seems incredible that vessels of 3,000 tons could be lost in this bay, but that is what has happened. In May, 1903, voyaging down the coast in the *Tucapel,* we were told that the *Arequipa,* of 3,000 tons burden, was the next ship following us. One night a savage tempest arose, many of the smaller vessels were wrecked, and the *Arequipa,* foundered and went down with the loss of a hundred lives.

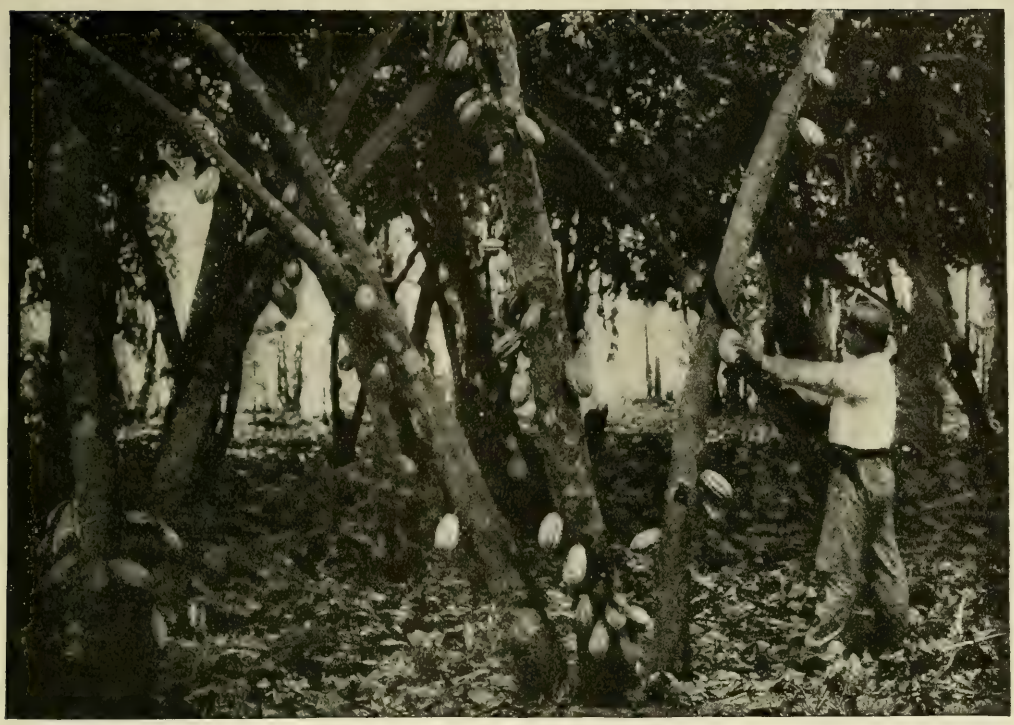
In July, 1904, another destructive storm swept along the coast. The lower part of the city was completely covered with mud and water, the sea-wall was destroyed, and the railroad badly damaged. The loss of life was not great, but the destruction of property was serious.

In the period from 1823 to 1893 the shipping statistics show the loss of 378 water craft in the Bay of Valparaiso, of which 100 were rowing and sailing boats. The money value was incalculable.

The Chilean government has at last, however, after many discouragements, accepted the plans of Mr Jacob Kraus, the Holland engineer, for conquering the difficulties which Nature has placed in the way of making Valparaiso Bay hospitable instead of hostile to the ships that bear the commerce of many seas. The estimated cost of the harbor improvement is $15,000,000 gold, though the initial provision was for $11,000,000. The scheme contemplates the construction of a series of sea-walls in the bay. The water is so deep that it is considered impracticable to build a single breakwater across the mouth of the harbor.

THE STARTLING DEATHRATE OF CHILE

The figures on the Chilean death rate are startling. The annual death rate has been placed as high as 70 per 1,000 and frequently it is given as 50 per 1,000. This is correct for the majority of the towns and cities, but does not apply to the country as a whole. The official statistics for a period of ten years, which I examined, did not exceed an average of 35 per 1,000; but even that is nearly double the normal death rate in the temperate countries; and Chile, not being in the Torrid Zone, is not subject to yellow fever and similar tropical epidemics. The figures showed that the birth rate and the



From "Panama to Patagonia," by Charles M. Pepper. Copyright, 1906, by A. C. McClurg & Co.

Cacao or Chocolate Trees, Ecuador

One-third of the world's supply of chocolate comes from Ecuador

death rate were almost balanced, since the birth rate ranged from 35 to 37 per 1,000. In 1895 the total births reported were 110,000 and the deaths 92,000, leaving an excess of 18,000 births over deaths. In 1898 the birth excess was a little larger; but in 1901 the births were 116,000 and the deaths 111,000, giving an excess of only 5,000. In previous years the births were not larger and have even fallen below the deaths. In a subsequent year a more normal condition was shown, the births numbering 115,813 and the deaths 88,607. In the two big cities no normal increase was contributed to the population. In Valparaiso Province, with 243,000 inhabitants, during a twelve-month period there were 9,475 births and 9,674 deaths. One year an epidemic of measles caused frightful ravages. In the year 1900, in the city of Valparaiso, the births were 5,610 and the deaths 7,170, and of the latter 2,245 were infants under one year of age. During this annual period the death rate per 1,000 in Valparaiso was 54.4. In Santiago Province, with a total population of 434,000, the births numbered 16,074 and the deaths 17,798. This excess was due to the city of Santiago, where there were 11,000 births and 12,500 deaths in a total urban population of 262,000. The mean average death rate is a little higher than in Valparaiso, though the latter is subject to the vicissitudes of seaports. In a given year only one city of more than 10,000 inhabitants showed a death rate of less than 50 for each 1,000. This was Antofagasta, in which the proportion was 44 out of every 1,000.

NATIVE BOLIVIAN VANITY

The prized possession of the Bolivian Indian woman and her chief pride also, whether she is pure Indian or chola, is her petticoat. Her dowry is in this garment. Like the Dutch woman of tradition, she carries her wealth about with her. These petticoats are of all colors of the rainbow and divers other hues not found therein. I first noticed them at Nazarene, and remarked the love of color, which must be inborn, for the garments were of yellow, purple, violet, fiery red, crimson, scarlet, subdued orange, glaring saffron, blue, and green. They were very short, reaching barely below the knee, and no difference was observed between childhood, maidenhood, matronly middle life, and wrinkled old age. Glancing from my window in Tupiza, I thought it was a parade of perambulating balloons.

These women have a habit which the bashful traveler does not at first understand. When he sees one of them calmly removing a petticoat he is apt to turn away, but he need not do so. It may be that the advancing heat of the day has caused the wearer to discard the outer skirt, but more likely it is the vanity of her sex, and the desire to make her sisters envious by showing what is beneath, for each new vesture disclosed is more brilliant than the one which overlapped it. I sat in the plaza at Tupiza and watched two Indian women try to make each other envious. The first one removed the outer petticoat, which was of purple. This divestment disclosed another garment of blazing red, and after that came a brilliant yellow. The other woman started with a green petticoat, and gradually got down to a mixture of blue and yellow. By that time I had begun to fear for the consequences, and made a pretense of turning my back by strolling to the hotel.

THE MEXICO OF SOUTH AMERICA

Bolivia, in the character, variety, and extent of her resources, is the Mexico of South America. Her mines yielded the precious metals for hundreds of years. She was the casket of gems held in pawn by the Spanish crown. She poured the riches of prodigal mother Nature into the lap of the mother country.

The present Bolivian silver production, which is 8,000,000 to 9,000,000 ounces annually, forms a very small proportion of the world's total output; but, with the building of railroads and the assured decrease of transportation charges, it is a safe prophecy that within a few years the output will be doubled, if not quadrupled. Here Mexico again furnishes the illustration.

FOREIGN INVESTMENTS IN SOUTH AMERICA

While the statisticians vary widely in their estimates, it is reasonable to conclude, from an examination of the leading ones, that Great Britain has $2,000,000,000 in South American investments, of which $300,000,000 to $350,000,000 may be assigned the west coast; Germany has from $475,000,000 to $500,000,000, with possibly $150,000,000 in the Pacific countries; and France, with about the same amount, has west coast investments reaching $100,000,000, her Chilean holdings amounting to $42,000,000.

"Commercial America in 1905," by Hon. O. P. Austin, is the title of a monograph just published by the Bureau of Statistics of the Department of Commerce and Labor. It gives the commerce, production, transportation, finances, area, and population of each of the countries of North, South, and Central America and the West Indies. The total commerce of America for 1905 amounted to $5,050,027,000, of which $2,806,119,000 was that of the United States, and the remaining $2,243,908,000 contributed by the other countries of North, South, and Central America and the West India Islands. All America exports considerably more than it imports, the figures being $2,865,650,000 and $2,184,377,000. The commerce of the United States consists of $1,626,984,000 exports and $1,179,135,000 imports. The monograph is distributed on application.

THE FERTILE PAMPAS OF ARGENTINE

An excellent Commerical Guide to South America is published by the Philadelphia Commercial Museum. The author is Edward James Cattell, assisted by H. S. Morrison and A. C. Kauffman. It is 10 by 12 inches, consists of 300 pages, and contains large maps of each county. Detailed information is given on almost every conceivable subject. The following paragraphs are abstracted from the book:

THE most easterly point of Brazil reaches a longitude much closer to the line passing through Liverpool than the line passing through New York city; for South America and Africa are separated by a shorter span of water than that separating New Orleans from the northern coast of South America. Buenos Aires, capital of the Argentine Republic, on the same parallel of latitude as Cape Town, is 650 miles nearer to that city than to the city of New York. So great is this easterly range of the Western Continent that more than three-quarters of the western coast of South America lies to the east of New York city.

The area of North America in round figures is 8,300,000 square miles, that of South America being seven per cent less, or 7,700,000 square miles. In mean altitude above sea-level both continents show practically the same record. Further, they are alike in being of triangular shape, with the apex in each case lying toward the South Pole. Although North America has an advantage in area, the point most distant from the coast in North America is practically the same distance from the coast line as in the most interior point in South America. It is also necessary to take cognizance of the contrast existing between the river systems of North and South America. In South America the heaviest rainfall takes place in that section which offers the broadest catch-basin, or drainage area, and this area lies in the heart of the continent, remote from the sea. In North America the division of greatest rainfall is of contracted area and lies close to the sea. This physical contrast lifts South American waterways into the position of great arteries of trade—commercial highways to the sea from centers of trade and population a thousand miles inland and often inaccessible to railroads.

The Argentine Republic has an area of 1,129,400 square miles, or about one-third the area of Brazil; it is four times the size of its western neighbor, Chile; twice the size of Bolivia, on the north; nine and a half times that of Paraguay, and fifteen and a half times that of Uruguay, both lying to the east. If transferred to the Northern Continent, this Argentine area would cover the Pacific coast territory from the Canadian line to the southern extremity of Mexico, including the states of Washington, Oregon, and California and all the states of Mexico. It could be divided into twenty-five states, each as large as Pennsylvania. From north to south it measures about 2,200 miles, or a distance exceeding that separating New York and Denver. In the northern part, or that nearest the Equator, the country has a width of 1,000 miles, equivalent to the distance between New York and St Louis; at the extreme southern limit of continental Argentine, however, the eastern and western boundaries are only 200 miles apart. Its coast line is equal in length to a line drawn from Key West, Florida, to Halifax, Nova Scotia. The wide range of climatic conditions prevailing in the Republic is indicated by the circumstance that its territory stretches over as many degrees of latitude as separate, on the Northern Continent, the most southerly point of Florida and the center of Hudsons Bay.

THE NATURAL DIVISIONS OF THE REPUBLIC

Although the larger portion of the Argentine Republic is popularly described as "the plains," the country

falls naturally into three great latitudinal divisions, each possessing marked characteristics of conformation and individuality of vegetation. The division of greatest importance and area is that bearing the name of the "Pampas" and occupying the central section of the Republic. From an elevation of about 2,000 feet in the foot-hills of the Andes the pampas sweep eastward to sea-level at the Atlantic. For the greater part they are treeless and covered with a growth of coarse grass which improves rapidly under grazing. The soil in most sections is rich alluvium, often from three to six feet in thickness, formed by decaying vegetation. This soil rests upon sedimentary deposits of earth scoured from the Andes and adjacent highlands. On these great pampas, or prairies, are pastured the majority of the cattle and sheep for which the Argentine Republic is famous, while districts under cultivation now produce more than half of the corn raised in the Republic.

The second division, which occupies the northern third of the Republic, passes under the general title of the river basin of the Parana. Here immense tracts of country, similar to the southern pampas, are devoted to the raising of wheat and the pasturage of cattle, while the fertile banks of the Parana and the Paraguay rivers are the scene of extensive agricultural colonization. Still farther north lie the sugar lands and the sections rich in timber. The soil of the river-basin country is sedimentary deposit of unusual breadth and depth, for the rivers have so frequently shifted their course that the deposit covers an area of 750 miles long and 400 miles wide, ranging from 30 to 100 feet in depth.

The third natural division of the country comprises the Patagonian plains, which form the southern portion of the Republic. These great plains of gravel and sand once formed a bed of an ocean which rolled against the Andes; they require irrigation to become productive. A number of small valleys of extreme fertility exist, however, in this division. Four salt lakes situated in this section are of commercial value.

While the country justifies the general description of a country of great plains, within its limits are to be found the highest mountains in the Southern Hemisphere, conspicuous among them being the giant uplifts of Aconcagua, 22,860 feet, the highest point in America.

LA PLATA—THE SECOND RIVER SYSTEM OF THE WORLD

The second largest river system in the world finds its way to the sea near Buenos Aires, capital of the Argentine Republic, bringing to that port commercial tribute from 10,000 miles of inland waterways—rivers which, ultimately consolidating in La Plata, discharge into the Atlantic a volume of water 84 per cent greater than that discharged into the Gulf of Mexico by the Mississippi River. This vast river system is almost wholly the gift of neighboring states, the volume of water in the greatest river of the system being as large where it enters Argentine territory, 825 miles inland, as at the river mouth, loss by evaporation equaling gain from intervening streams. The circumstance that these rivers are full-grown when they first cross the boundary line of the Republic—due to the equatorial drainage area having an annual rainfall of 60 inches—renders them of large commercial value. On the Parana, for example, vessels drawing 21 feet can reach the port of Rosario, 230 miles from Buenos Aires; vessels drawing 19 feet, Santa Fé, 350 miles; those drawing 15 feet, Corrientes, 850 miles, while craft drawing 8 feet navigate affluents of the Parana to points in Brazil distant over 2,000 miles from Buenos Aires.

BUENOS AIRES

Buenos Aires, capital of the Argentine Republic, with a population on September 30, 1902, of 861,513 and an

area of 72 square miles, is the largest and most important city of South America, the largest city in the Southern Hemisphere, and the second largest city of the Latin race in the world. Measured by foreign trade standards, it ranks second among American cities, its outward and inward tonnage being more than half the size of that credited to New York and four times as great as the tonnage of San Francisco. Liverpool, a representative old-world shipping center, ranks below Buenos Aires in area and population, and its tonnage is only 50 per cent greater than that of the Argentine capital. As regards situation, Buenos Aires lies as far south of the Equator as Norfolk is north of the Equator. It is distant from New York 5,868 miles; from Liverpool, 6,154 miles; from Hamburg, 6,500 miles; from Cape Town, South Africa, 5,218 miles; from Sydney, New South Wales, 6,300 miles, the last two cities named being on the same parallel of latitude with Buenos Aires. The city spreads over a level plain situated on the right bank of the great La Plata Estuary, 150 miles back from the sea and 125 miles west of the city of Montevideo, Uruguay, which lies on the northern side of the same estuary. It extends 11¼ miles from north to south and 15½ miles from east to west, with a circumference exceeding 38 miles. The low-lying character of the city's situation, which ranges from 15 to 50 feet above sea-level, combined with the shallow and shifting character of the channel of La Plata, has forced the construction of extensive and enormously expensive harbor works; these works now provide facilities for handling shipping in excess of 20,000,000 tons a year.

Buenos Aires is the commercial as well as the political center of the Argentine Republic, being the gateway and primary market for the larger portion of the trade of the Republic. Although the largest Spanish-speaking city in the world—double the size of Madrid—almost every language is spoken within its limits, four-fifths of its citizens being of foreign birth. Italians are more numerous than natives and there are 100,000 Spaniards resident within the city. Eighty per cent of the immigrants to the Argentine Republic come to Buenos Aires and it is the permanent home of 18 per cent of the population of the country.

THE ANNUAL HARVEST

Taking agriculture, one of the great industries of the country, as an illustration, we find the total area under crop to be only 17,464,958 acres. This is one-twentieth of the area available for crops. Indeed, it is estimated that in the provinces of Santa Fé, Corrientes, Cordoba, and Buenos Aires alone there exist over 157,000,000 acres of land capable of growing fine crops of wheat without artificial watering. From an area one-quarter the size of this, the United States now raises one-fifth of the world's wheat supply. To rightly measure, then, Argentine probabilities in the matter of agricultural development, we are thrown back upon the development already existing in certain provinces where wealth and energy have concentrated. Following this line of investigation, we discover that the Province of Buenos Aires, with an area of 69,000,000 acres, about two-thirds as large as California, in 1901 had 1,974,404 acres under wheat, producing 27,996,288 bushels; 1,683,287 acres under corn, producing 51,690,298 bushels; 259,390 acres under linseed, producing 3,650,968 bushels; 27,529 acres under oats, producing 577,654 bushels; 7,286 acres under barley, producing 66,782 bushels. This same province carried 52,630,451 sheep, 7,745,896 cattle, 1,675,385 horses, 248,720 pigs, 11,955 goats, 10,273 asses and mules. Within the limits of this one province, including the capital city, Buenos Aires, there were located, when the census of 1895 was taken, 14,000 manufacturing establishments, employing a capital of

$65,000,000, with 97,000 employees and 1,560 separate pieces of machinery, and yet this small section of the Republic, with its large agricultural, pastoral, and manufacturing development, contained a population of only 2,000,000, or less than one-third the population of Pennsylvania.

THE FALLS OF IGUAZU

By Marie Robinson Wright

Author of "The Republic of Chile," "The New Brazil," "Picturesque Mexico," etc.

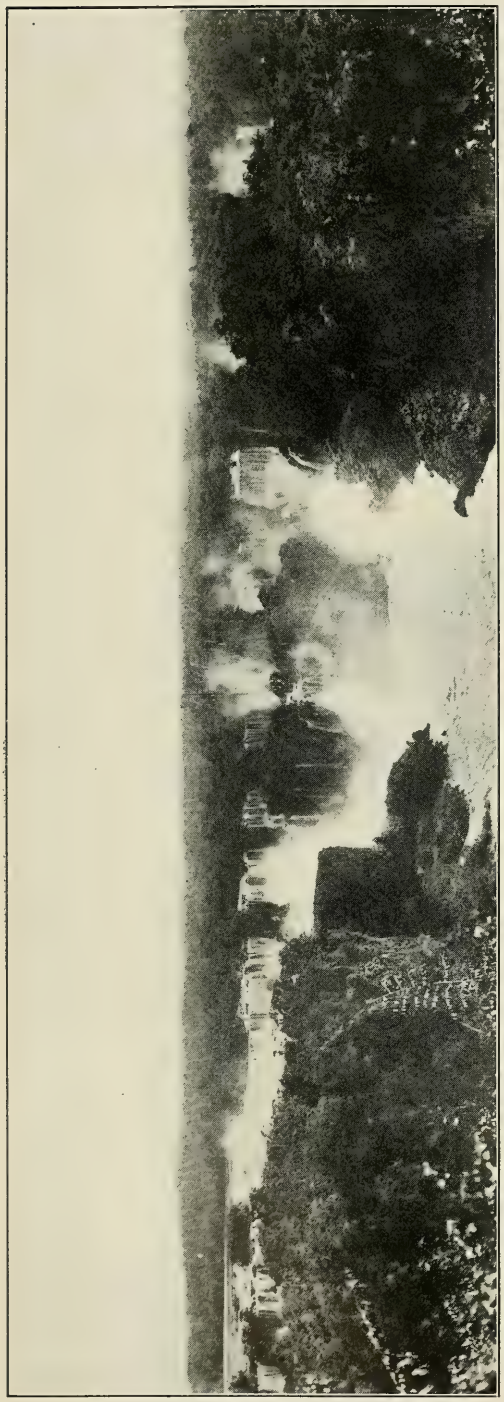
IN the heart of South America, at the meeting place of three republics, Brazil, Argentina, and Paraguay, Nature has chosen the site for a masterpiece of scenic grandeur, to be compared only to the mighty Niagara in majesty, and pronounced by some of the few travelers who have seen it to be even greater than its North American counterpart.

The Falls of Iguazu occur at the junction of Iguazu River with the Upper Parana, in a territory famous as the original locality of the Jesuit missions, established in the sixteenth century, the ruins of which may still be seen by those who visit the falls. The history of these missions alone makes them sufficiently interesting to warrant a journey thither, and the fact that they have survived centuries of disaster from fire and storm speaks volumes for the enduring character of the work done by the simple natives of what was then a savage country, under the civilizing influence of the celebrated Company of Jesus.

There is no other spot in South America, except the site of the ancient empire of the Incas, where historic interest and natural beauty are so allied in attractiveness as in the land of "Las Misiones," where it overlooks the Iguazu Falls on the Upper Parana. In the course of the Upper Parana there are many notable waterfalls, among them the Guayra and the Nacunday, of considerable fame, but none equal the magnificence of the Iguazu. Until recently the inaccessibility of this region prevented its being known to any but daring travelers, willing to bear the fatigue and discomfort of many days' journeys across the pampas and through the forest, under the blaze of a tropical sun and subject to the annoyance of innumerable insects, with no accommodations along the route, nor at the end of it, except such as the traveler himself could provide. But now that the Argentine government has recognized the importance of opening up a route to the missions and the falls, regular excursions take many visitors to Iguazu from Buenos Aires and other Argentine cities. The return trip requires about two weeks, and can be made with comparative comfort by train to Posadas, on the Upper Parana, and thence by a small steamer in a few hours to the falls. Occasional excursions are also made all the way from Buenos Aires to the falls by steamer. The approach to the falls is heralded by the thunder of the cataract, which may be heard many miles away. About twelve miles above the falls the River Iguazu makes a sharp bend, almost at right angles, giving them greater extent and more varied character than those of Niagara, which to some degree they resemble. Indeed, a comparison between the two affords the best means of judging of their relative claims to preëminence, and is, perhaps, necessary in order to give an adequate idea of the appearance of Iguazu.

The cataract of Niagara makes a clear leap in an enormous sheet of water

The River Iguazu, where Three Republics Meet



General View of the Falls of Iguazu, from the Brazilian Side of River

twenty feet thick over a precipice varying from 150 to 180 feet in height. Above the falls is a broad expanse of river, and below them a narrow gorge through which the water is forced in a rapid torrent. The setting of this magnificent chef d'œuvre of Nature is a cluster of busy modern towns, with only the intervening parks to put them in harmony with the glorious work they serve to frame.

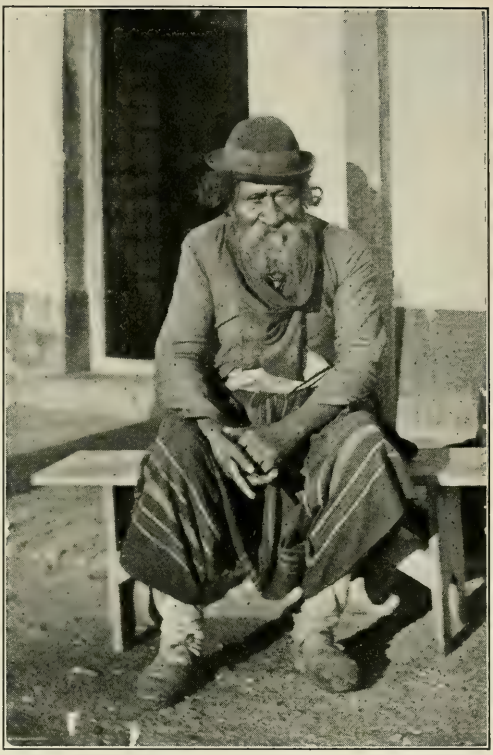
The Falls of Iguazu offer a notable contrast to Niagara in many important features. As the river makes the sharp bend already mentioned, the main volume of water rushes round the inner bank and is discharged into a long, narrow gorge, at one point making a clear plunge of 210 feet. Not all the volume of the river is received at this place, however, the rest of the water running out past it into the wide elbow formed by the bend, and circling along the further shore among many rocks and islands before reaching the edge of the cliff, over which the descent is made in two great leaps of a hundred feet each, in a vast semicircle of 3,000 feet. The total length of Iguazu Falls, if measured at the upper edge of the cliff, through their broken contour, including intersecting islets, is twice as great as that of Niagara, including the intersection of Goat Island.

The double fall of Iguazu is the most striking feature of the cataract, the rocky shelf or platform that divides the leap being in some places over fifty yards wide and in others only a few feet.

The scenery surrounding Iguazu Falls is in peculiar harmony with the solemn grandeur of the cataract and its varied character. The roar of the waterfall is more impressive for the solitude of the spot and the eternal silence that reigns in the dense forests that mark its border, into which the white man has scarcely penetrated. For several miles before the falls are reached, the river is a mass of huge frowning boulders and whirlpools, and the first view of the great cataract is often a disappointment, from the fact that it must be seen from many different points to be appreciated in all its beauty.

The outline of Iguazu Falls is so broken that one can hardly gain a correct idea of its immense width, and even the great height of the cataract loses something in effectiveness by being divided into two leaps instead of forming one stupendous fall. But, on the other hand, the charm of the South American falls as they plunge out of the hidden recesses of a semi-tropical forest at a hundred different points is unequaled elsewhere, and the traveler may look in vain the world over for a rival to their seductive beauty. Here Nature revels in perfect abandon and presents a spectacle seldom seen in these days, when the surging tide of travel rolls in upon her most secluded retreats with its "modern improvements." Iguazu remains so free from the meddling of man that one can imagine the picture to be much the same today as when it first came from the Creator's hand in the primeval days "when the morning stars sang together."

From the falls to the ruins of the Jesuit missions the route is along forest paths overgrown with tropical verdure. In the heart of a thick wood, covering more than a thousand acres, the ruins of San Ignacio, so named for the founder of the order, stand in persistent survival of all the agents of destruction that have attacked it during the past two centuries. A proof of the remarkable fertility of this region in which the Jesuits established their settlement is shown in the marvelous growth of the forest which now marks the site, most of the trees towering to a height of more than a hundred feet, although it is only about eighty years since the Jesuit capital was burned down. The only open space in this wilderness of woods is in the center of what was formerly the settlement—a public plaza around which the houses were built—and strangely enough no trees have grown on this spot, though they have pushed their way through crevices in the walls that mark where the houses stood and have buried under their branches the greater part of the ruins. Occupying all one side of the plaza was the church and the ruins



An Old Timer

of this edifice present many interesting features. The coat of arms of the Jesuit order are still in evidence, as well as some of the sculptured figures of the portico. The dimensions of this building were about 250 feet long by 150 feet broad. Behind the church was the college, with eight large class-rooms, and near it the refectory and cellars.

All the work of the missions was performed by the Indians, under the direction of the Jesuit fathers, and not only the churches but the dwellings of the Indians themselves were so well built by them that the ruins of these houses are as well preserved as those of the temples. Each house was 17 feet long by 14 feet wide and had a window and a door in front and a door at the back leading to the garden. In each house was a niche, presumably for the statue of some saint.

It is impossible not to admire the

San Ignacio. The Front Portico

genius of Loyola's followers, who were able to teach the arts of civilization to the savage so successfully that after more than three hundred years the record of their work remains to attest its strength and beauty. There still exist the evidences of good architecture, and creditable sculpture; and though, as is well known, the Jesuit edifices all over the country are remarkable for a lack of technical accuracy in their architectural design, yet they stand a great monument to the persistent energy of the most important civilizing agency in South America for two centuries after the discovery, and they represent an influence that extended from the Amazon to Cape Horn, of which proofs are to be found among the remotest tribes of the interior of the continent, who still preserve in the traditions of their people many of the Christian teachings brought to them by the Jesuits.

Photo from A. H. Kirkland

Gypsy Moth Caterpillars Beneath Burlap

Malden, Mass., July 12, 1905

THE GYPSY MOTH

SOME years ago a gentleman of Massachusetts, who was of an experimental frame of mind, imported some gypsy moths from Europe, in the hope of being able to cross them with the silk worm, and thus obtain a type of silk worm sufficiently hardy to stand the Massachusetts climate. Unfortunately his experiment failed, and some of the gypsy moths escaped. In the course of time they spread until they became known as the gypsy moth pest of

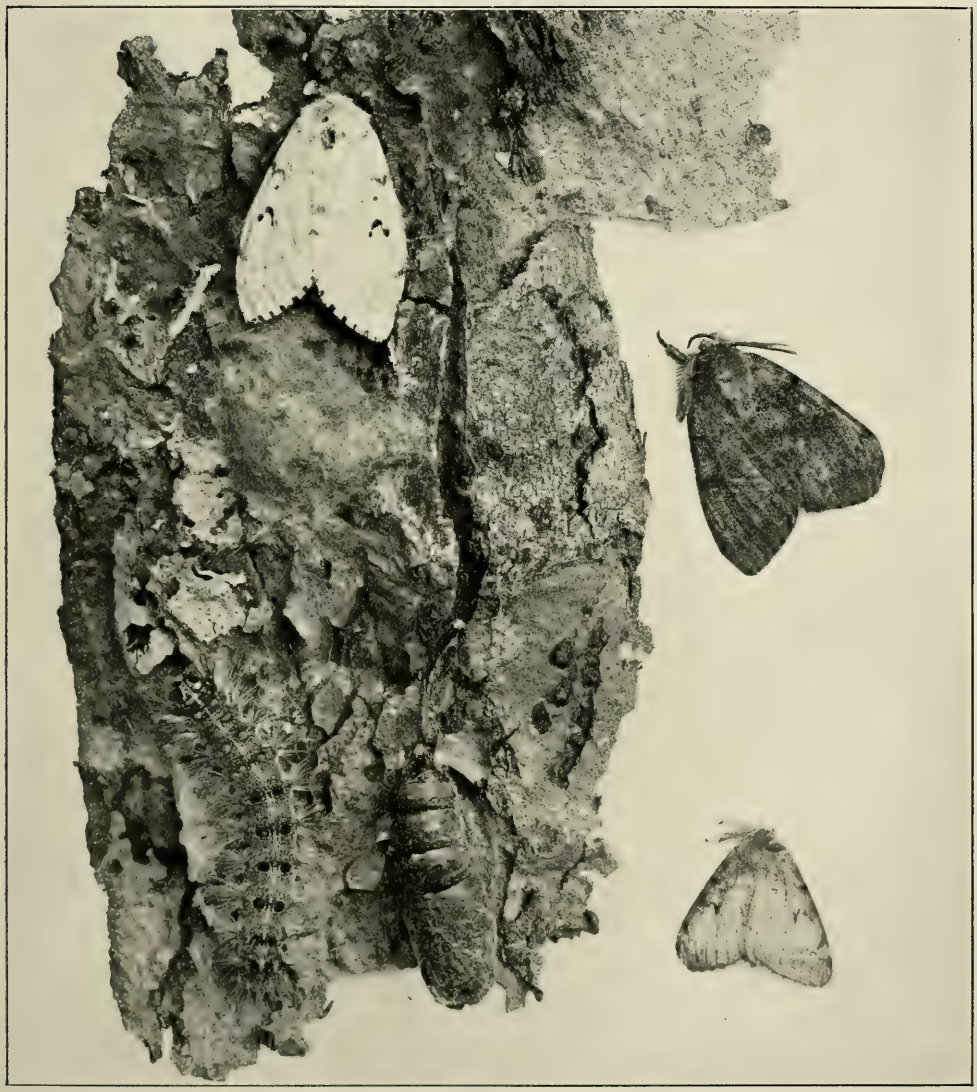


Photo from A. H. Kirkland

Various Forms of the Gypsy Moth

Female moth (white) laying eggs. Male moth (brown). Pupa. Larva

Photo from A. H. Kirkland

Woodland Stripped by Gypsy Moths

Menotomy Rocks Park, Arlington, Mass., June 30, 1905

Photo from A. H. Kirkland

Dead Pines. Stripped by Gypsy Moth

eastern Massachusetts. Another destructive moth, the brown-tail moth, obtained an entrance several years later, concealed in a shipment of roses from Holland.

The State of Massachusetts has spent about $1,000,000 trying to check the ravages of these two moths. At one time it had them pretty well under control, but

Photo from A. H. Kirkland

Female Brown-tail Moths Laying Eggs on Cherry

Reading, Mass., July 17, 1905

the omission of an appropriation for several years enabled them to spread again, and the last several years they have been more destructive than ever. Recently it was recognized that some method in addition to destroying the nests and caterpillars must be devised to exterminate the moths, and a parasitic enemy of the moths has consequently been imported from Europe.

The gypsy moth is seen in many sections of Europe, but its ravages are comparatively mild because of the existence of a four-winged fly which lays its eggs in the gypsy moth caterpillar. To secure this, fly-infected caterpillars are imported. The United States Department of Agriculture, acting in coöperation with the gypsy moth service of the State of Massachusetts, has organized a service in Europe whose business it is to collect the gypsy and brown-tail nests and ship them to America. During the past season 116,000 moth nests were imported into this country. These nests were kept in sealed cages until the caterpillars developed, and the expert knew what was to come out of the nest. Each caterpillar was then carefully examined, and all caterpillars found to be free of the parasite were destroyed, whereas the caterpillars that contained the parasite were distributed in those parts of Massachusetts where the gypsy moth is most prevalent. As each nest contained about 250 caterpillars, the work involved the examination of over 25,000,000 caterpillars, and of these one-half of one per cent, or about 100,000, were found to contain the parasite. (It is interesting to note that many caterpillars contained parasites other than the desired variety; 52 different species of parasites were in fact discovered and destroyed.) The parasite fly breeds much more rapidly than the moth, two to three weeks being sufficient for its full development. The work of introducing the caterpillars is under the direction of Dr L. O. Howard, Entomologist of the Department, who is acting in coöperation with Dr A. H. Kirkland, Superintendent of the Gypsy Moth Service of Massachusetts.

THE SHATTERED OBELISK OF MONT PELÉE

By Prof. Angelo Heilprin

Author of "Mont Pelée and the Tragedy of Martinique," "The Tower of Pelée," etc.

Of the remarkable phenomena which enter into the history of the recent activities of Mont Pelée, and of the activities of volcanic mountains generally, few have attracted more wide-spread attention than the extrusion, through the Pelean apex, of a core of rock which, at the time of its greatest development, attained a height of upward of a thousand feet. This block of rock, which thus rose the better part of twice the height of the Washington Monument, in the city of Washington, and had a thickness at its base of from 300 to 500 feet, was a fundamental part of the history of the volcano for upward of a year, not improbably already existing in a minor or concealed form at the time of the destruction of Saint-Pierre, and continuing into the period of August to September of the year following (1903). Today nearly all that was of it lies in shattered fragments, covering up much of what before was the ancient crater basin of the Étang Sec and of the domed mass which has been constructed nearly centrally over the floor of this basin. The fragments of disruption occur in many sizes, from boulders of two to three feet diameter or less to others having the more respectable measure of ten, twenty, or even thirty feet. Their numbers make up a veritable wilderness of debris, from among which fumarolic vents are still at intervals forcing vapor, and in which at favored spots the eye detects small growths of fern and other lowly types of vegetation.

The generally active condition of the volcano, whether in its wilder or gentler mood, had until this year virtually barred all approach to this great rock monolith, and thus made its study a matter of inferential deduction rather than of actual observation. A long period of quiescence in the activities of Pelée has now made access to its central parts possible, and the riddle of the mountain is no longer kept to itself. Taking advantage of this condition of the volcano, the writer undertook a fourth journey to the island of Martinique in the month of February of this year, and, as he believes, successfully accomplished the object of his visit.

We arrived at Fort-de-France on the 21st of the month, five days after a fairly severe seismic movement, when the inhabitants of the capital city were still seeking refuge from possible earthquake visitations in short flights to the *campagne* and when Pelée was again coming in for a fair share of (wholly undeserved) excoriation. Despite cable reports to the contrary, the volcano was wholly passive—except for quiet emissions of summit steam—on the 16th, when Castries, on the island of Saint Lucia, suffered much, and Fort-de-France considerably less. A record of 35 to 40 houses more or less injured hardly has significance from the earthquake point of view, but it was sufficient at this time to point to graver possibilities or even probabilities in the near future, and hence *le volcan* and *les tremblements de terre* were an almost fixed topic of conversation with everybody. I made my accustomed pilgrimage to Saint-Pierre, now a disappearing ruin in an encroaching jungle, and on the second day following made my way over to the northeastern side of the island and established myself as heretofore, under the hospitable roof of the Usine Vivé. On February 27, starting from the Habitation Leyritz,

Photo by Prof. A. Heilprin

The Obelisk of Pelée

Photograph taken from the crater rim on June 13, 1903, looking north-northwest. The great puffs of steam issue from the contact zone between the obelisk and the "dome" (seen in the lower part of the picture), which envelops its base.

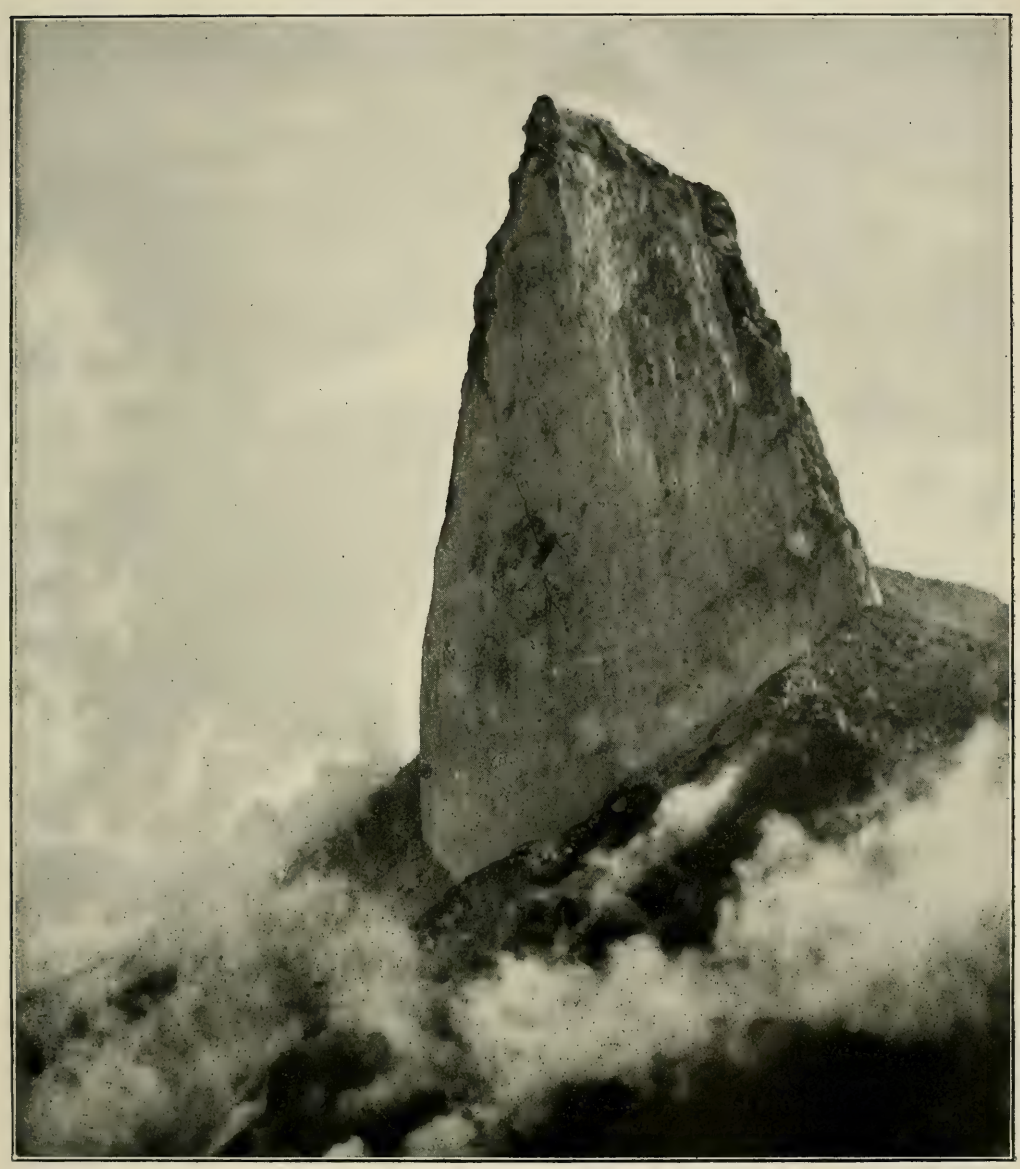


Photo by Prof. A. Heilprin

The Obelisk of Pelée

Photograph taken from the crater rim on June 13, 1903, looking approximately southwest. The obelisk passes sharply through its supporting dome The smoothened surface, worn down by attrition against the wall of its enveloping chimney, is represented with a height of 840 feet.

when the tree-toads were still croaking and when Nature shrouded the landscape in a veil of darkness, M. des Grottes and myself, with two assisting carriers, bore off to the easy arête which steadily moves up to the summit of the volcano. A nasty rain, which came and went with intervals, dogged our trail for the better part of an hour and added little comfort to the little that goes with these trips. Once on the open slope of the volcano, however, everything went well, and my mount, the Arabian "Mocha," did its share of the journey in an unusually pleasant way, showing only scant signs of fatigue up to the point where conditions made it desirable to leave the animals. This is now considerably more than half way up the mountain.

We gained the summit, in a not particularly satisfying drizzle, shortly before eight o'clock, only to find that little was to be seen beyond. The crater basin was full of shifting clouds and vapors, and only in rarest snatches could we pick up through thinning areas the form of the massive dome and of its covering debris. At the spot where we reached the crater-wall, by some of the good people of the region facetiously called the *salon*, there were marked evidences of recent slipping and subsidence, and for some distance back of the border new separating lines told plainly of the reaches that before very long were to be added to the crateral hollow. A shift in the wind brought the greater part of the dome momentarily into view, and also cleared up what remains of the old Morne de la Croix. Its flank, a short distance from the brink, carries the new cross which in great state was planted on the 14th of September last. On this day Pelée was in gala form, for not less than six hundred inhabitants of the island formed part of the procession that followed the cross to the summit, moving up in a long continuous line that to some may have been reminiscent of the Chilkoot trail. A minor wooden cross has also been erected near the eastern border of what was formerly the basin of the Lac des Palmistes.

Following the rim of the crater along its northern face, or in the direction of the Petit Bonhomme, we found a spot where it seemed that a descent might be made over the very sharp knife-edge, and where, indeed, an earlier descent had already been made by my associate, together with two companions, MM. Salet and Beaufranc. A very stiff wind was unfortunately blowing over this crest, and for a time it seemed that its persistence would thwart our effort to gain the rim. My own affairs were not particularly encouraging either, for I had but one good foot, and dragged another as a reminiscence of a mishap on board the steamer of our voyage. Once over the rim, however, we were on fairly easy ground, and the scramble to the bottom was quickly made. Here we were immediately brought into contact with the parts of the obelisk, which were lying about everywhere, almost completely cloaking the body of the dome itself and measurably filling in the horseshoe-shaped area of the old crater basin. Close to the point of our descent the depth of the crateral cavity could hardly have reached a hundred feet. Westward of our position it was still less, while directly under the old Morne de la Croix it may have more nearly measured 150 to 200 feet. The dense vapors (in the absence of an aneroid) did not permit of any accurate determinations of depth at this time. The width of the hollow at its base had been reduced to hardly more than a rock-space in some places; elsewhere it widened out to a number of yards, and from its boulder-strewn surface steam was issuing in scattered jets.

Having secured the necessary footing, we almost immediately began the attack upon the dome itself, a sufficiently easy undertaking in the present condition of the volcano and requiring no care beyond that which attaches to

Photo by Prof. A. Heilprin

The Shattered Obelisk of Pelée

Photograph taken on the northeastern face of the dome on February 27, 1906, looking out over the debris, which in small and large angular masses covers nearly the entire dome surface on this side. The rock is a compact hypersthene-andesite.

The Dome of Pelée

A portion of the dome on its eastern face, where it is in part built up by fluidal lava (June, 1904)

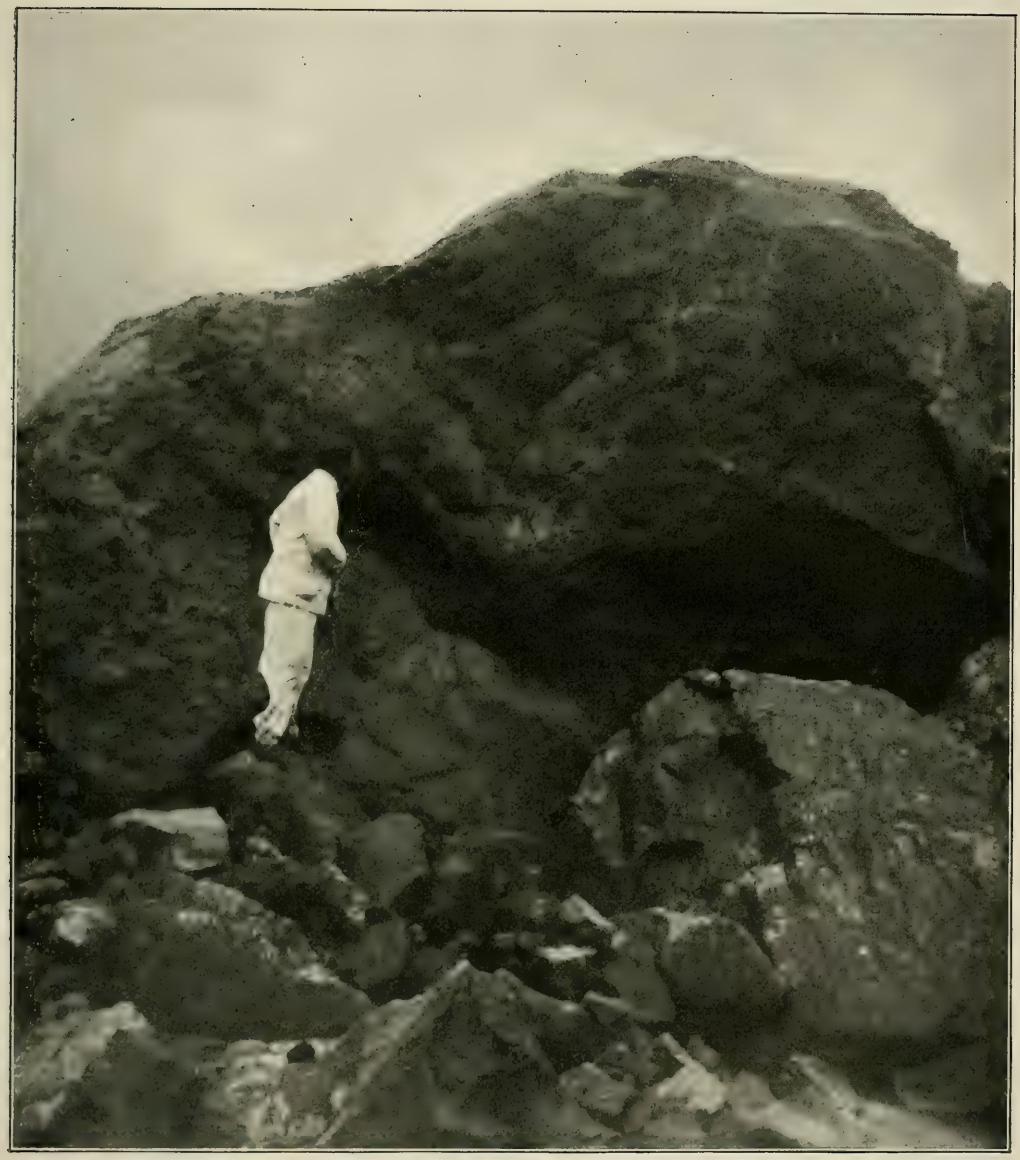


Photo by Prof. A. Heilprin

The Shattered Obelisk of Pelée

Giant blocks of hypersthene-andesite lying near the base of the dome in the surrounding *rainure*. Photograph taken on February 27, 1906, in the northeastern part of the old crateral basin.

the wise caution of looking where you walk. Loose boulders would be sent from time to time flying down the slope, giving out that peculiar sound, as of breaking glass and china-ware, which had already been noted by those who had made the early ascents to the crater rim, and as far back as the close of May, 1902. This "vitreous" or clinkery sound had been attributed by some—among whom I must class myself—to a possible vesicular or obsidian-like structure in the falling rock masses; but manifestly the condition was independent of this structure, for we found the rock to be everywhere of compact form, destitute of gaseous cavities, and nowhere even approximating obsidian in aspect or composition. Petrographically it is a light-gray, fine-grained hypersthene-andesite, of almost holocrystalline texture and differing but little from some of the older rocks of the volcano. It seemingly belongs to type IV of Lacroix's classification of the ejected products of Pelée (quartzitic andesites), although some give a faint indication of loose aggregation (approximating the rocks of type III ?), perhaps resulting from weathering, or, what seems to me more likely, the action upon the surface of superheated steam or other gases. As before remarked, we found no scoriaceous, clinkery, or vesicular masses of any kind, although it might be going too far to say that such do not exist buried up in the wilderness of material. At two points on the dome we came upon the extruded smoothened surfaces of the "ribbing" which forms part of the true structure of the dome itself, and found them to have virtually the same lithological characters as the boulder masses beneath which they were in greater part covered.

Having gained a point on the dome which, at times of clearing vapors, well overlooked the wall of the Morne de la Croix, and beyond which the further ascent is complicated by projecting pinnacles and a disagreeably steep gradient, we drew the line of our journey and turned our steps downward. Somewhat more caution was necessary in this descent than in the ascent, but without mishap the bottom of the *rain-urc* was found, and a slow, steady pull brought us again to the rim of the crater-wall. The wind was still blowing a semi-gale in this quarter and clouds hung heavily over the vertical summit of the volcano. Now and then the basal wreck of the great obelisk protruded its tooth-like form through the shifting vapors, giving to the mountain an aspect of savage ruggedness.

When before this visit I last stood on the crater rim the great obelisk of rock, like a veritable Tower of Babel, still rose 840 feet, a sheer precipice, above the summit of the dome which to-day bears merely a serrated crest. At that time, in the middle of 1903, the fires of the volcano were still burning, and steam and sulphur vapors were being puffed in great clouds through the mass of the dome itself, and through the zone of contact that united the dome with the gray and silent rock that rose out from it like a giant plug or cork. At that time, and from that time nearly to this, the geologist was still in doubt as to the precise characteristics of this singular volcanic excrescence—unique apparently in our world, but not unlikely duplicated in some of the tall objects, sending nearly straight shadows, which appear in some of the large crateral pits of the moon—but today we at least know what was its constructural rock material, even if a considerable doubt still attaches to the precise method of its formation.

The view that is seemingly most generally held by geologists as to the origin and construction of the Pelée tower is that which has been advanced, and so ably elaborated by Professor Lacroix, the chief of the scientific commission sent out by the Academy of Sciences of Paris to investigate the happenings on the island of Martinique. This view is, in its simplest

terms, that the giant rock mass represented a rapidly and recently cooled highly acidic lava, whose tension and viscosity were such as to permit of solidification at or about the time of extrusion; it belonged to the present period of eruption, and thus took the place of the free flows of lava which are ordinarily an accompaniment of the normal type of volcanic eruption. The pressure exerted on the ascending magma by the solidified dome which is thought to have closed over the central orifice is considered by Lacroix to have been an important factor in the production of solidification, even if not its absolute determinant.

While seemingly simple in its explanation, there are yet many difficulties in the way of the acceptance of Lacroix's hypothesis, and some of these I have pointed out, in advance of the publication of the monumental *La Montagne Pelée et ses Éruptions*, in my "Tower of Pelée." A few of these, to which others are added, are here enumerated:

1. The hypothesis of M. Lacroix compels a belief in the rapidity of the cooling and solidification of large lava masses which is seemingly at variance with all knowledge that we possess regarding the behavior of rock masses in fusion. The Pelée obelisk, although rifted much in the manner of the jointing of other rocks, was virtually solid to the core, and none of its decapitations disclosed moving fluid lava in the interior. We are thus forced to believe that a full cooling and solidification of the constructing lava mass had in an almost incredibly short space of time extended completely through the substance of the extruding part. At the time of its final disruption, in the early autumn of 1903, it is true that the basal scar was described as being a vast glowing brazier; but I should say that this condition was brought about by the forcing into the base of the monolith of some of the same lava which elsewhere was oozing out, and constructing, or helping to form, the supporting dome. Indeed, it may well be that the destruction of the obelisk was brought about largely by an "eating" into the mass of burning lava.

2. The hypothesis involves the assumption that the tower or obelisk was one of the later constructions associated with the awakening of the volcano, having been *preceded* in time by the construction of the dome, and its rise is dated back only to the middle of October (or November) of the year 1902. But, as has already been intimated, there are grounds for believing that it already existed within the chimney of the volcano as early as the fatal 8th of May, and its presence there as an obstructing "plug" may well have been responsible for the force and downward stroke of the destroying cloud that annihilated Saint-Pierre. There can hardly be a question that the scraggy and apparently cindery mass which I described in my earlier reports as defining a wall in the crater, and which is so well illustrated by Mr George Varian in the paper (*McClure's Magazine*, August, 1902) which details our ascent of the mountain on June 1, 1902, was the identical rock. While at Morne-Rouge on the day following (June 2), Père Marie assured me that three distinct tooth-like structures were plainly visible from the belfry of his cathedral, "looming up" above the crater's rim.

3. Professor Lacroix has pointed out, what seems to me to be in opposition to his own views, that the volcano had for several weeks maintained a condition of parallel (opposed) activity at the summit: the construction of a fluidal dome and the simultaneous erection of a rigid spine or tower. It would be difficult to explain this divergent condition on any theory of almost instantaneous cooling of outwelling lavas. One could hardly expect to find an outwelling mass so behaving as to lend itself to the formation, at or near the same place and under very nearly

similar conditions, of two structures which were so largely dissimilar in habit as the fluidal dome and the rigid spine. If the substance of the dome was able to maintain its fluidity, it might reasonably be argued that the mass of the obelisk would have been able to do the same. On the other hand the divergent condition is entirely consonant with any theory that holds that the extruded rock was an ancient rock core that had been bodily lifted from its moorings, and that it bore no relation in its making to the newer activities of Pelée. This is the view that I myself hold and is that which I have enunciated elsewhere. M. Lacroix has in many places pointed out that the mechanics of the two structures were independent of one another.

4. On the theory of a rapidly solidifying lava, one would naturally expect to find the surface of the cooling body giving out vapors from its inner parts, but the Pelée obelisk, except, perhaps, along lines of rifting or near its base, never, so far as I am aware, exhibited this peculiarity, the tower of rock looming up at all times grimly cold and dry, and with much the appearance of steam having acted upon its surface.

To the objections that have here been stated others less direct might also be urged. My recent journey has, perhaps, not contributed much to the elucidation of the subject, except in so far as negatively it has failed to determine, in an examination of much rock material, any evidences of recent solidification of the same. To this extent, therefore, it tends to support my contention, that the obelisk of Pelée was an ancient volcanic plug which bore no relation in its formation to the newer phase of eruption of the volcano, and was lifted bodily, as the result of extreme volcanic stress, in the manner of the great block of granite (and domite?) of the Puy Chopine, in the Auvergne.

WHAT THE LATIN AMERICAN REPUBLICS THINK OF THE PAN-AMERICAN CONFERENCES

THERE was recently held in Philadelphia, under the auspices of the American Academy of Social and Political Science, a special meeting devoted to the Pan-American Conferences, at which a number of notable addresses were given. The various speakers defined very clearly the significance of the conferences and the achievements of the two conferences that have already been held. Summaries of the speeches by the Mexican Ambassador, the Brazilian Ambassador, the Costa Rican Minister, and the Bolivian Minister, printed below, are interesting in that they give the Latin-American point of view.

BY THE MEXICAN AMBASSADOR, SEÑOR LICENCIADO DON JOAQUIN D. CASASUS

The Congress of the United States, by the act of May 24, 1888, authorized the President to invite the governments of Mexico, Central and South America, Haiti, and Santo Domingo to hold a conference in conjunction with the United States, with the object of discussing and recommending to the respective governments a plan of arbitration for the solution of conflicts that might arise between them; to treat besides on matters pertaining to the development of commercial traffic and of the means of direct trade between those countries,

and to improve the reciprocal commercial relations that might be beneficial for all. Never before had such an extensive program been presented for an international conference, nor had it been considered possible that such a program could be a matter of discussion between delegates of different nations.

The labors of the Pan-American Conference were of concord and peace; it had not the purpose, like the congresses of Leybach and Verona, to restore a form of government and authorize a nation to reconquer her colonies; nor was it inspired either as the Congress of Panama, a dream of the great Simon Bolivar, with the necessity of uniting the persecuted to resist the attacks of a common aggressor; but, seeking rather the union of all in a general effort, it undertook to create the general commercial prosperity of the hemisphere, giving this prosperity a basis of peace by means of the amicable solution of international conflicts.

The invitation of the Congress was addressed to all the governments of the American Continent on the 13th of July, 1888, and after all of them accepted it the Conference met at Washington on October 2, 1889, with James G. Blaine, then Secretary of State, in the chair. For a period of six months the program of the Conference was largely discussed, and its resolutions were in the form of simple recommendations to the respective governments.

The City of Mexico having been selected for the Second Conference, the government of the United States of Mexico, on the 15th of August, 1900, addressed an invitation to all the governments of the American states to assemble in October, 1901, in the capital of the aforesaid republic.

The program was as extensive as that of the First Conference, and was calculated to give rise to long and thorough discussion of all those principles that serve to lay the foundation of the agricultural, industrial, commercial, and political prosperity of America.

But the principal achievement of the Conference in Mexico, one which is destined to perpetuate its name in history, is the convention on obligatory arbitration of pecuniary claims, which, having been ratified by the Congress of the United States, by that of Mexico, and by Peru, will soon be also approved by all the other nations of this hemisphere.

To understand the wide scope of this convention it is sufficient to consider that, notwithstanding the gigantic efforts made in all the civilized world to renounce force to obtain redress, this is the first time the principle which the great Argentine jurist, Carlos Calvo, enunciated, that the collection of pecuniary claims should never be made by force, has been consecrated in a general and obligatory form.

It is not possible for human sagacity to penetrate the future, to ascertain what the next and the succeeding international American conferences are to be in the course of time, but it can be affirmed without fear of falling into error that each one will be of more importance than the preceding, and that all of them will strive with more eagerness to strengthen the bonds which are to unite the nations of this hemisphere.

If we have seen that a union of the nations is to be accomplished at the cost of some sacrifices of national selfishness, and if we have reflected that in the long run these sacrifices, without suppressing the frontiers which divide nations, contribute to the organization of future humanity, it is but natural to suppose that all of these conferences which America is to hold from time to time are to be landmarks in the way traversed until we reach the ideal that protects and encourages us. The American Continent, governed by free institutions, ruled by just governments, impelled by noble ambitions, is the most appropriate field for establishing the new forms of future international law, and we may hope that to the crea-

tion of these new forms the Pan-American conferences will direct all their efforts.

BY THE BRAZILIAN AMBASSADOR, MR JOAQUIM NABUCO

The function of these periodical assemblies of the American republics, as it appears to me, should be, first, to create and manifest to the world the American conscience; secondly, to form the American public opinion. I am employing the word American in the sense of continental.

The American conscience is the sentiment of our own separate orbit, absolutely detached from the European, in which Africa and Asia, not speaking of Australasia, are moving. With all our sympathy and interest for Europe, conscious of all we owe to European influx, products as we are of the overflow of the European races, doubting even that in our soil the stems of European culture could ever produce the same fruits or the same flowers as in their native soil, we, however, are a political system wholly unconnected with the orbit of Europe.

An obstacle to the growth of this Pan-American conscience lies in the great shadow your great country throws over the rest of the continent. But it will be a matter of good sense and of sincerity for the Latin republics to recognize a fact that the whole world is conscious of and frankly acknowledge the guarantee afforded to the separateness of the whole American system by the existence in its midst of a mass of human energy that practically balances the rest of the world.

SOUTH AMERICA BELIEVES IN THE MONROE DOCTRINE

For the formation of the American conscience it is necessary, therefore, that the Latin republics do not look to the part that the United States had and has to play in guarding the Monroe Doctrine as in any way offensive to the pride and dignity of any of them, but, on the contrary, as a privilege which all ought to support, at least with their sympathy and their gratitude. That will, no doubt, be the ultimate result of the Pan-American conference, as, working together with you, they all will understand better your aims, your sincerity, and your disinterestedness.

The other great function of these conferences is the formation of a common public opinion throughout the continent. You have seen in what words Secretary Root put it in an address he delivered the other evening at the Brazilian Embassy in Washington: "May we all do our share toward the building up of a sound and enlightened public opinion of the Americas, which shall everywhere, upon both continents, mightily promote the reign of peace, of order, and of justice in every American republic."

I am glad he expressed himself in that way, as I have always maintained that everything in that direction depends absolutely on the creation of a common American opinion.

The great laws of the physical world apply, we may be sure, to the moral world as well. You could not conceive a religion, an institution, a society, that would remain impenetrable to the spirit of the age, as that would be the same as imagining a body without porosity; neither can you imagine nations mixing and working together without showing in the length of time distinct traces of the civilization as liquids in communicating vases will show the same level. These conferences are the means of communication, until they become the communion of the American republic. They are bound to take one day the same level. Remember that Latin-America in these conferences is mixing with your democracy, the like of which, both in scope and magnitude has never before been seen in history. This American democracy is a great magnet for freedom, for progress, and for peace.

I will add one word more, since I am

at one of the centers of America's highest culture. What the conferences and meetings of the governments can do is much in itself, but it is little compared to what would be done if the people, the liberal minds, the institutions, the organs of public opinion of the different American republics, were to approach each other, to have their own conferences, to show real concern in their common progress, in seeing that no country remains hopelessly behind the others. That is the much broader and much deeper task that is waiting for the awakening of the universities of the two Americas, chiefly of yours, for a generation of masters and students possessed of the continental spirit and anxious to see American civilization expand and equally cover the whole New World.

BY THE COSTA RICAN MINISTER, SEÑOR DON JOAQUIN BERNARDO CALVO

Speaking for Central America and especially for my own country, I wish to say a word. That precious link between the two Americas to the blessings of being in the center of this continent, bathed by the two great oceans, inhabited by peoples of no common intelligence, orderly and progressive, adds to its glory one of which we are proud. The independence of Central America was the consequence of the triumphs of the great patriots of Mexico and South America, and was declared on the 15th of September, 1821, and only two years later, by a single decree, the abolition of slavery was accomplished at once, without any indemnity being paid to the owners of the slaves who were themselves the first to support this humane measure. Such an act shows how Central American people appreciated the benefits of liberty, which they owed to their greater neighbors, and that they were well enlightened for their new life as a free people.

To be relatively small is not a disgrace. Material grandeur, if certainly desirable, is not the acme of greatness, and we know that the latter exists where justice rules, where the general good is the supreme law, and where the aspiration is toward the consideration and respect of the other nations and toward the common advancement of humanity.

Now we are divided into five independent states, with Panama as a sixth, which may eventually merge into a greater nation. But, whether united or divided, the states of Central America have shown at all times their love for progress and advancement; they have coöperated with true ideas of Pan-Americanism to the success of the first and second conferences; therefore you are assured that they fully recognize the broad as well as narrow interests which the republics of America have in common, and will cheerfully now, as they have in the past, endeavor to do their part in the intelligent progress that the Third Conference is destined to bring about.

BY SEÑOR DON IGNACIO CALDERON, THE BOLIVIAN MINISTER

When a handful of pilgrims abandoned the home of their fathers for conscience sake, and undertook to cross the ocean, seeking their freedom, everything before them was uncertain, except their faith in God and their deep and strong love for justice and right.

They brought and propagated in the New World all the virtues that go to make a man a true and worthy image of his Maker; and from such seed have developed a nation that in due course of time has come to be, not only a great world power, but the sacred asylum for all liberty-loving people.

Great as is your material strength, astonishing as is your progress and the expansion of your industries and commerce, and amazing as is the accumulation of wealth and the well-being of the great majority of the people of the United States, nothing appeals with greater force to my mind than the prac-

tical working of the principles of equality and freedom, limited only by law, which fact I consider as the mainspring of all your advancement and power.

When I contemplate the humblest citizen enjoying all the privileges and having open to him all the honors and the rights that in some other nations are the patrimony of the few, I cannot help exclaim that American democracy is truly the consummation of the conquests of liberty and justice in the world.

Now, on the other hand, if you please, remember for a moment how different was the material that came to colonize and settle the other portions of the American continent. When you consider that the men who conquered Peru and Mexico were nothing but adventurers seeking for gold and the satisfaction of their hunger for wealth, that after vanquishing and destroying highly organized nations submitted their inhabitants to serfdom, that the history of the three centuries of Spanish dominion is only a long chain of despotism and tyranny, you readily understand that when the Latin-American republics, after many years of fighting for their freedom, succeeded at last and made themselves independent through their own exertions, their traditions and their education was far from suited for the proper exercise of free and orderly government.

That is why during the early times of their independence, and some of them even up to this day, had to pass through a dark period of formation and revolutions.

Fortunately the majority of the republics in that section that is really South America have entered firmly upon an era of peaceful development of their natural resources, under well-established governments.

Bolivia had also an epoch of misfortunes, and after sad experiences that cost her the loss of much of her territory is now earnestly seeking to develop her great wealth and future.

Her mineral resources are second to none, and the Bolivian mountains contain a wonderful variety of minerals. The silver mines of Potosi are famous in the history of the world, and have contributed a large share to its wealth.

Silver, copper, antimony, bismuth, gold, and at present tin are the principal of many minerals that her territory produces.

An Italian scientist, Mr Raymondi, who has devoted his whole life to the study of Peru, has called Bolivia "a silver table standing on legs of gold."

The Andes getting into Bolivian territory divide themselves into two big branches. One toward the coast forms the western Cordillera, and the other leading toward the interior and the east is called the Cordillera Real. Between these two branches extends the high plateau where most of that mineral wealth is to be found.

In the eastern section are vast plains, where wild cattle and horses roam, and the virgin forests, where rubber, Peruvian bark, and a great many other medicinal plants and all kinds of fine woods grow luxuriantly. The reason why in the commerce of the world a great many of these Bolivian products are not known as such is because on passing through neighboring republics' territory they are shipped from their ports, and hence the Bolivian copper, for instance, passing through Chilean ports is considered as Chilean copper. The Bolivian rubber shipped at Para is called Para rubber, etc.

My government is at present endeavoring to build a system of railways that will connect the north and the south of the country and facilitate the development of its resources. An idea of their importance may be had in knowing that in a few years, and notwithstanding the absolute lack of means of transportation, we have increased our exports of tin from about 2,000 tons of crude ore to 25,000 tons last year; and it is a remarkable fact that Bolivia is the only tin-producing

country in America; and as this metal is found almost all over the country, its future is great. The United States consumes for its industries about 43 per cent of the tin in the world, and for the want of banking facilities, direct transportation from South America here, and custom hindrances, you are compelled to get from Europe the Bolivian tin; and this is the case with many other South American products.

When the roads that are now being surveyed are completed one of the most important links of the Pan-American Railway will be made, and then it will be possible to go over a distance of about 2,000 miles, from La Paz in Bolivia to Buenos Aires in the Argentine, in a few days by rail.

A COUNTRY WITHOUT A DEBT

I will also mention the fact that Bolivia is absolutely free from any foreign debts, and instead of owing any money, has at her disposal $10,000,000 in gold devoted to the building of railways, and that her revenues are sufficient, not only for all the expenses of the administration, but to leave some surplus to pay the interest of the additional capital that we are seeking for the construction of the roads I spoke about.

We will welcome the rivalry of capital and the enterprising spirit of the Americans, and I earnestly hope that the leading men of this country will pay more attention to the great possibilities that are to be found in every one of the South American countries; and that coming in closer contact the peoples of the North and the South will learn to understand each other better, and to see that South America is not a field only for revolutions, but that her people are just as progressive and ready for advancement as any in the world. And by this means a true Pan-American feeling may be developed in a great democratic brotherhood based on the mutual respect and estimation of its citizens, and thus banish all feelings of mistrust and fear.

REASONS WHY THE UNITED STATES IN PARTICULAR SHOULD ENCOURAGE THE PAN-AMERICAN CONFERENCES

THE following paragraphs are quoted from testimony of Hon. Elihu Root, Secretary of State, before a committee of Congress, urging substantial support of the Conference at Rio de Janeiro.

I think that the work of the Bureau of American Republics, the existence of the International Union, and the holding of these conferences afford altogether the best means of breaking up the comparative isolation of this country from the other countries of America and establishing relations between us and them in place of the relations—the rather exclusive relations—that have existed hitherto between them and Europe.

Our relation with them has been largely a political relation, while, on the other hand, the ties of race and language and inherited customs and usage—the relations which have come from the investment of great amounts of European capital in their country, which have come from the establishment of numerous and convenient lines of communication between them and Europe—have made the whole trend of South American trade and social relations and personal relations subsist with Europe rather than with the United States; so that while we occupy the political attitude of warning Europe off the premises in Central and South America under the Monroe Doctrine, we are comparative strangers to them and the Europeans hold direct relations with them.

Now there is, I think, a strong and genuine desire on the part of the South American statesmen—and they have very many able ones—to promote a greater knowledge on the part of their people of the people of the United States, and on the part of our people a greater knowledge of the southern republics, and to promote greater inter-

course. Just at this time, of course, the great increase of capital in the United States is on the threshold of seeking investment abroad. We are about at the close of the period during which all our capital and all our energy were engrossed at home, and I can see in the State Department an enormous increase of business relations between Americans and other countries. They are going into construction work and are pushing their way, making banking transactions, and all over Central and South America capital is ready to go. I take it to be the proper function of government to help create situations of friendly relations and good understanding, which will make it possible for capital to go.

* * * It seemed to me that I could not do any more useful work to the country for the promotion of American trade interests and at the same time for the promotion of these relations which tend to maintain peace and harmony than to foster and advance this tendency which finds its expression through the Union of American republics and these successive conferences.

UNITED STATES DELEGATION TO RIO

The personnel of the board which will represent the United States at the Conference of the American Republics July 21, 1906, at Rio de Janeiro, Brazil, consists of the following: W. L. Buchanan, chairman of the Commission; Leo S. Rowe, of the University of Pennsylvania; Mr Larrinaga, Porto Rican Commissioner in Congress; Van Leer Polk, Tennessee; ex-Governor A. J. Montague, of Virginia; Paul S. Reinsch, of the University of Wisconsin, vice James S. Harlan, declined, and Charles R. Dean, of the State Department, secretary of the Commission. In addition to these the Bureau of the American Republics will be represented by its Director, Williams C. Fox.

GOOD BOOKS ON MEXICO, CENTRAL AND SOUTH AMERICA

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"A Commercial Traveller in South America," being the experiences and impressions of an American business man. Frank Wiborg. McClure, Phillips & Co. 1905. Illustrated. $1.00.

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Photo by Robert H. Chapman

Death Valley from Summit of Grapevine Range

Telescope Peak in background is 40 miles from camera

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THE NATIONAL GEOGRAPHIC MAGAZINE

THE DESERTS OF NEVADA AND THE DEATH VALLEY*

"AND STILL THE DESERT WAITS"

BY ROBERT H. CHAPMAN
U. S. GEOLOGICAL SURVEY

THE area lying to the west and southwest of Salt Lake City and extending to the Sierra Nevada and the ranges east of Los Angeles was for a long time included under the caption "The Great American Desert."

The discovery of gold in California in 1849 was the beginning of the conquest of this thirsty region, the direction of greatest travel being but little south of west from Great Salt Lake to the vicinity of the Donner Pass in the Sierra Nevada, since used by the Central Pacific Railroad in crossing this range. In seeking for better routes to the new El Dorado, parties journeyed southward across the wastes of sand and rock searching for the lower passes which would be perennially available. In this direction the number of mountain ranges to be crossed is largely increased, but by going well southward the great wall of the Sierra Nevada is escaped, though the desert journey is very much lengthened and the hardships encountered by many parties were most appalling.

The desert took frequent toll in the lives of man and beast, and indeed does sometimes today, though the dangers are now comparatively insignificant.

With the discovery of the Comstock mines there came a period of tremendous activity in the search for the precious metals, more particularly for silver, and much of the desert region was traversed by the hardy prospector and his burro. In this way the long distances between watering places were divided by the discovery of springs and "tanks" (natural reservoirs), and gradually this part of the "American Desert" diminished in area and lost some of its fearfulness.

In the 60's and 1871-'72 government expeditions under Lieut. George M. Wheeler traversed several routes across the desert, making topographic sketches and notes of interest and value, but few complete maps were printed. In 1865, and several times since then, the boundary line between Nevada and California was run, which cut through much of the most difficult country. The reports of

*An address to the National Geographic Society, March 24, 1906. Published by permission of the Director of the U. S. Geological Survey.

and the stories by members of these expeditions did not tend to populate the region with great rapidity.

In many instances the prospectors were successful, and the camps of Silver Peak, Lida (or Allida), Reveille, and others sprang up, and had their periods of rise, prosperity, and decline, many becoming completely uninhabited.

During the period of activity many travelers became permanent residents, took to wife dusky maidens from the Indian tribes, and located ranches at various springs and streams, oases in the expanse of waste, where small herds of cattle or horses were maintained.

From the eastward the Mormons pushed gradually away from the streams of southern Utah and established farms and ranches at such places as furnished water, but there is a belt of country one hundred miles or more in width between these points and the water-fed valleys at the foot of the Sierra Nevada, which is almost wholly barren and very dry.

RENEWED INTEREST IN THE DESERTS

During the last few years, beginning with the discovery of valuable ore at Tonopah (in May, 1900), the attack upon the desert has been renewed with great vigor and earnestness, and the efforts of the seeker of Fortune met with so much success and at such widely separated points that it was decided by the officers of the Geological Survey to put parties in the field to make a reconnaissance of some of the unmapped desert area.

The area where work was done lies about 200 miles southeast of Carson City, about 350 miles southwest of Salt Lake, and 250 miles northeast of Los Angeles. It comprises about 8,600 square miles and has a great range in elevation; the highest point reached is 9,500 feet above and the lowest about 300 feet below the level of the sea.

The idea of the person unacquainted with American deserts is of a great plain, sand-covered or rock-littered, with nothing to relieve the monotony of the horizon. As a matter of fact, these great areas include mountain ranges, high plateaux, mesas, and buttes, extensive valleys, that in the clear air seem but a short distance across. Many of these valleys are "closed"—have no outlet—and the lowest pass from one to another is often many hundred feet above the valley floor. The flowing streams are very few, the springs far between, and water a commodity for which men search, often with life at stake.

The map includes an area, almost equal to the total area of Delaware and Rhode Island, of 3,000 square miles that is waterless except for small holes that may be filled by occasional rains.

LIFE IN GOLDFIELD, NEVADA

In entering the desert area the party traveled by rail to Tonopah, and thence by auto to Goldfield, which a short time ago was but a cluster of tents, and here headquarters camp was established. The town lies at an elevation of 5,700 feet, in a basin between the foot of Columbia Mountain and a mesa edge several hundred feet high. The immediate vicinity is not of great ruggedness, differences of 800 feet being extreme, though eight miles westward the Montezuma Peak rises to a height of 8,400 feet above sea.

Since January, 1905, the town, together with its sister, Columbia, has "boomed" and quieted, and been "born again" to a steady, healthy growth. The demands of business are such as to warrant the erection of substantial buildings of wood and stone; there is at least one church, an ice plant, swimming pool, a brewery, a club; pipe lines bring water from distant springs, and there are the numerous sources of amusement common to all new mining camps; every bar and hotel has its roulette wheel and corps of players, "cappers," etc. Here one may eat most of the dainties of the season—fruits from California, vegetables from Utah, fresh meat from Chicago; he may drink almost any brand of wine or any mixture of liquors to be found anywhere, while selections from the latest operas are rendered on violins and piano. One meets

men from every part of the globe—prospectors from Alaska, mining engineers from London and Africa, business men from every large city, and the burros, "angels" of the desert, are universally present. There are numerous mines producing ore, some of which is shipped for treatment, some crushed in local "custom" mills, and some by mills controlled and operated by the owners of the mines. (Gasoline is used for power in most cases; wood retails at $18.00 per cord.)

Insurance is unknown, regular companies declining the risk. On a windy day in July (8th, 1905) a fire was started which destroyed several blocks of tents and buildings. It is a matter of interest that at least one building was saved by using beer to prevent its igniting; the bottles were thrown against the building as modern grenades are used. One week later the town of Columbia was severely damaged by fire, the roaring flames, flying sparks, with pyrotechnic explosions of dynamite, making a scene to be remembered.

It is the dustiest vicinity I have seen, and when one of the many "twisters" (cyclones often of no mean proportion) strikes one, he can only "shut up" everything about himself and do no breathing until it goes by.

Provisions are high priced and hay worth 2 cents to 3 cents per pound.

With the advent of the railroad in Goldfield, and from this point to outlying camps, the means of transportation is varied—for the passenger the modern high-power automobile or the more primitive stage-coach. For freight supplies of all kinds for man and beast, traction engines hauling trains of wagons, or several coupled wagons drawn by six to eighteen horses or mules, are used.

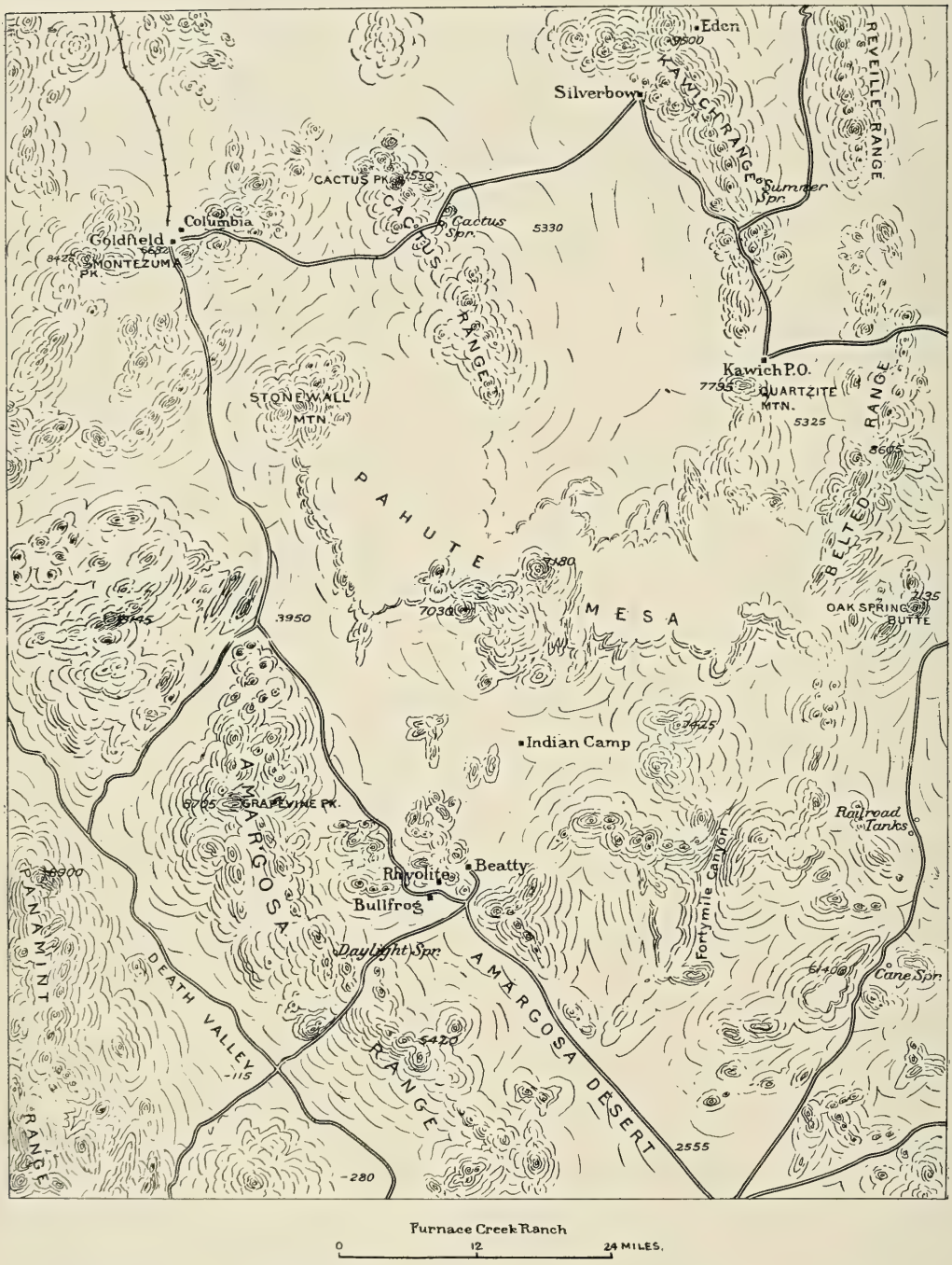
Nowhere in the world can one find greater contrasts than in this region. But a few miles from town one may ride or drive for hours—perhaps days—without meeting a human being, his eyes aching with the brazen glare and the monotony of the billowing hills and mountains, which hours of travel seem to bring no nearer.

THE STONEWALL FLAT

From Goldfield the work of mapping takes us to the eastward, away from the auto and freight roads to Bullfrog and the southern camps. Across the Stonewall flat—a great inclosed valley, with its playa bottom of baked mud as hard and as smooth as concrete and as white as snow—to the Cactus Range, which extends in a northwest-southeast direction, with a rugged rock cone at the north end, known as Cactus Peak, which is a landmark for an area of a thousand square miles. An example of the uselessness of the maps of the region is here apparent; all these show the Cactus Peak to be to the south of Cactus Spring, which is the first water east of and 25 miles from Goldfield, while in reality the water is eight miles south of the mountain. This spring we find to be high in the range, and in this it is typical. Palatable water is seldom found in the flats or valleys unless sought by wells of considerable depth (100 to 200 feet). This range is made up of a series of volcanic flows, and near the Cactus Spring we find a fine example of basalt or rhyolite, columnar structure, lying like cordwood beside the road.

The Cactus Range is separated from the Kawich Range by a great valley, like that of Stonewall, long slopes of gravel and drift reaching from the ranges to the flats in the middle, which, as looked upon during the day, swing, rise and fall, in hazy heat waves like the billows of the sea. Toward the north end of the Kawich Range, at the new townsite of Silverbow, we find a stream of running water, and we push on to get above the camp and pitch our tents below the ragged cliffs.

At Silverbow and vicinity there are several hundred men, a few women, many good prospects, and much hope. The place is about as comfortable as any in the region, but desert prices prevail; hay is worth $80.00 per ton in bulk and grain $5.00 per sack (of 75 pounds).



The Death Valley Region, Nevada

To the east is the trail to "Eden," which we follow, crossing the Kawich Range, the highest peak of which is 9,500 feet.

From the pass we look along the summit, which is flat and broad—the remnant of an old surface which has been much eroded. We find the "town" to be a scattering lot of tents, but aptly named, for there is a small creek of running water, green, fresh grass, willows and small cottonwood trees, rose bushes, ferns, and grateful shade. The first man we greet states his name to be Adam(s), and asks us if we have seen any snakes, of which he assures us there are plenty, but Eve and apples we do not find.

The prospectors here show us claims, some having ores of gold and others of rich silver. We spend some days in mapping this country and examining the rocks, and then take up our journey southward along the range, which is usually supplied with timber, springs, and grass. Here there are numerous bands of horses, some of them wild, others acquiring wildness, and in turn endeavoring to thrust wildness upon the beasts of the traveler (three of ours strayed and are not even yet recovered). At one spring seven dead animals are found, killed by the shots of the stock-owners, who wish the water for beasts of use and value. Like the Cactus, this range is largely made up of volcanic flows.

We cross the Kawich Range on the pass above the "Wild Rose" Spring, and camp at the Sumner Spring, where there is water and wood, and after removing various rats, gophers, and insects from the spring, we are well located, with a beautiful view of the Reveille Range, which rises 3,000 feet above the valley to the eastward. In the desert it is very difficult to get satisfactory photographs—the distances are so great that the picture may include a whole range, miles away and several thousand feet high, but there is nothing to give scale to the view—nothing by which one can measure it. In the Reveille and adjacent valleys antelope are sometimes seen, but animal life is not abundant.

From Sumner Spring we journey by buckboard to the Reveille Range, which is crossed by the steepest wagon road I have ever seen. Over this road the ores from the mining camp, Old Reveille, were hauled to the mill in the valley, 16 miles away.

At the top of the mountain we look across another rolling summit of volcanic rocks; near by are a few buildings, a new boarding house, and several wooden shelters. Here "outside" capital is interested in the development of "prospects;" the water is hauled four miles, from the spring at the "Old Camp," which thirty years ago was a busy town, but now going to decay.

Horses and mules unaccustomed to the region are afraid of the deserts, and it is often very difficult to get them started over an unknown road when leaving a good campground behind; a nerve-wrecking delay may follow and heroic measures become necessary. Some of our animals lay "hog tied" in the cooking sun for hours before proceeding over a new route.

KAWICH—A GOLD CAMP

While the northern end of the Kawich Range is well supplied with water, grass, and trees, the southern part is dry and barren. Here, about 80 miles from Goldfield, at the foot of Quartzite Mountain, some of the ledges of rhyolite which show through the drift carry gold, and as this is the magician that turns a desolate waste into a semblance of civilization, we find a camp, complete, yet lacking everything. The description of an investor from Italy I quote: "Kawich is a h—ll of a place! No mines, no water, no feed, no women," which discloses one point of view.

The water is hauled by team from Cliff Springs, 12 miles away, making a journey of 25 miles a day to keep the town from drying up, and is sold at $3.00 per barrel. (Extensive bathing is not generally practiced.) If this spring fails,

the wagons go to the Wild Rose Spring, 16 miles distant.

At the Gold Reed Mine we see some very beautiful gold ore; the metal occurs in a ledge of rhyolite which is highly silicified, and there is so much of it that none need ask to see it.

The Belted Range lies east of the Kawich Valley. It is composed of volcanic rocks, which weather in cliff forms that are very beautiful, many reaching 1,500 feet in height. Many rocks show columnar structure, horizontal, curved, and vertical, when looked at more closely.

The valley at Kawich extends southward many miles, and then rises to a high table-land which breaks abruptly to the south, forming a mesa front. To the eastward the Belted Range runs about north and south, and where it joins the mesa land the Oak Spring lies. A butte known as Oak Spring Butte rises just north of this water—a landmark; it is at once an aggravation and a comfort to the traveler, as he can see it for miles, and journey apparently toward it, circle around it, but not reach it.

Oak Springs is about sixty miles by wagon road from Kawich, with but one small spring between and a road heavy with sand. It is a wearying journey at best, and men and animals are glad indeed when camp is pitched. Here there are prospects of gold and of copper; azurite fine enough to be cut and set in jewelry is found, and some of it has been shipped for that purpose.

From the top of the Oak Spring Butte a panorama of interest unfolds: To the west and north the high plateau region, besprinkled with scattering cedar and piñon trees, cut by sharp-walled canyons, and limited by the backbone of the Belted Range is one of the most arid parts of the desert. To the east and south is the long sweep of an unnamed valley, the slopes of drift reaching from rock-walled range to the white enamel lake bed far in the distance. Across this valley we journey. The road, often sandy and slow, is relieved by stretches hard and smooth, which are in themselves a rest to horse and rider. In the bottom we find a great tank of water; it resembles a stream without flow, head, or mouth. The water surface is perhaps 200 yards long, 2 to 5 yards wide, and has a maximum depth of 3 feet. We are fortunate in that a fierce thunderstorm with heavy rain passed a day or so before and filled this reservoir, which had been dry for months, to overflowing. The water is already dark brown and alkaline, but we fill every canteen and barrel and journey onward for the next permanent water.

The road rises slowly to pass between low buttes, and we find ourselves surrounded by giant yucca, or Joshua, trees; some of them are large and spreading, but give little more shade than a barbed-wire fence.

When we reach the Cane Spring, one of the watering places on the old emigrant road—when to reach it from the north a dry journey of 70 miles was necessary—it has taken us three days from Oak Springs, and the distance is not more than 35 miles. Here the tired, emaciated horses rest, wander in the barren hills seeking grass and finding sage brush, greasewood, and creosote bush.

Grain, which should have reached us, has not come, and we are distressed and worried lest more animals die and leave us stranded. We estimate it is 40 miles to the nearest hay—at a stage station on the freight road from Las Vegas to Bullfrog. We choose a light wagon, the four freshest animals, and succeed in getting back with a few bales in time to keep our bony quadrupeds from starvation.

For many weeks we have been skirting the edge of the area indicated as dry. It has been necessary to make small shelter camps far within the area and to haul water many miles across the trackless flats.

There are quite a number of animals that leave tracks and marks near the water-holes. During certain months thousands of wild doves flock from desert flat or bench land to spring or tank. These flights and rabbit trails converging toward a single point are of great as-

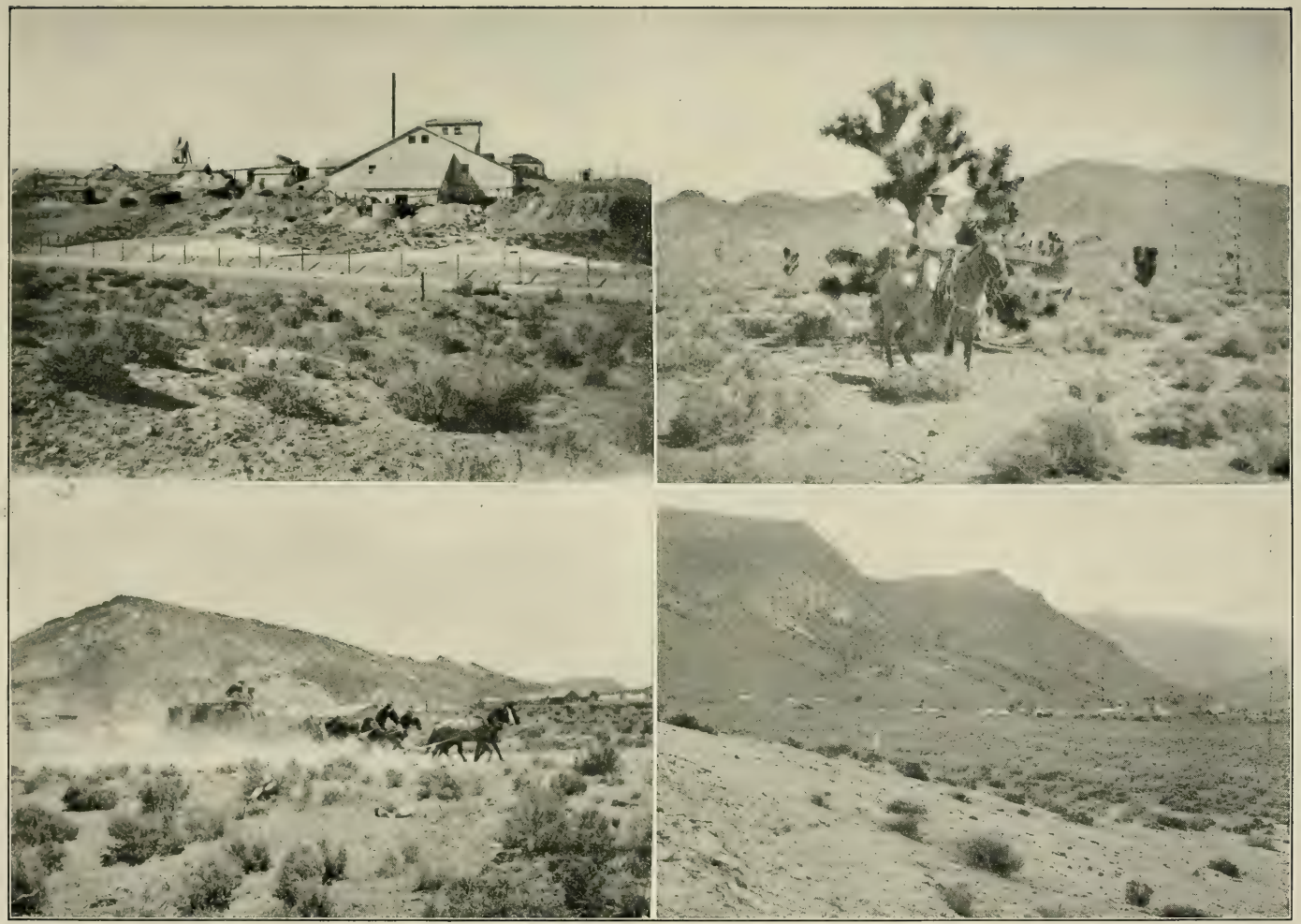


Photo by Robert H. Chapman

The Combination Mill at Goldfield
Traveling by Coach through the Desert

Giant Yucca or Joshua Tree
Silverbow, a New Camp

Photo by Robert H. Chapman

Marble Canyon

Route of old trail to Owens Lake Valley

sistance to one in search of water. Humans use many devices—usually heaps of stones or cairns or small sticks placed as pointers; these may be of great comfort or encouragement, though if the tank proves dried up, or to have been emptied by some wandering prospector to save his burros and fill his canteen, much distress and anxiety may follow.

From the Cane Spring we turn westward, and the Grapevine Range before us rises 3,000 feet from the Amargosa Desert—a great sand dune, long a landmark to the traveler from Ash Meadows to Beatty Ranch—stands in the desert, which has heretofore claimed more than one victim. Before turning our faces toward Death Valley we proceed across the sloping plane to Bullfrog to replenish our food, overhaul our outfit, tighten water barrels, repair canteens, and arrange for forage which is to be hauled to us.

The towns of Bullfrog and Rhyolite are practically one, while Beatty is four miles east. The latter is situated on the Amargosa River, a small stream, but usually one has to dig to find it. I can give no figures as to population, for the inhabitants in most camps are a drifting lot—there may be many hundred, even a few thousand, one day, and soon afterward but a handful, as new strikes are made in outlying districts. At Bullfrog we find rendezvous camp which has been brought from Goldfield; as we pass up the street we find the omnipresent tent, a few adobes, and one house built of beer bottles set in mud. (These materials are the only inexpensive ones to be had.) At the head of the street rises Busch Mountain, one of the many peaks surrounding the camp, its sides scarred with the waste from prospect holes. One of our first experiences is to take a swim in a tank of goodly proportions fed by clear green water brought many miles in pipes. It is useless to try to express the joy and delight which comes in sporting and romping in the water, while parched bodies absorb the fluid until we are exhilarated as by a strong stimulant. It is our first wetting in—I blush to say how long! At Beatty we find a modern hotel with a wonderful variety of refreshment, solid and fluid, served to a nicety, including hammered-brass finger bowls, by men in conventional black evening clothes.

We look southward across the Amargosa Desert, stretching farther and farther until lost in the blue and amber of miles of heat with glittering sand and mud flats, flanked by the Bare and the Grapevine ranges, with the high peaks of the Funeral Range appearing beyond.

From Bullfrog the route lies across an extension of the Amargosa Desert to the Grapevine Range, to reach which we pass from arid Nevada into California, which here is hardly so luxuriant in foliage as its reputation might lead a stranger to anticipate, and at a boundary-line post set up for work.

THE DEATH VALLEY

Twelve miles southwest camp is made at the Daylight Springs, on the crest of the divide between the Amargosa Desert and Death Valley. We journey to one of the high peaks of the Grapevine and look into the "Valley of the Shadow of Death," as desolate a view as may be found.

In the distance the Telescope Range rises to an elevation of nearly 11,000 feet, while at our feet the salt-white plain is more than 6,000 feet below us and well below sea-level. The flat is 25 miles away, and on its borders not a vestige of vegetation appears. The valley was named Death Valley from the loss of members of parties of emigrants who attempted to pass through it in 1849, and since then a number of persons have been lost, keeping up the sinister record as a graveyard, but the appalling stories of the number of persons perishing there each year are exaggerated. It is not safe to go into Death Valley for active work during July, August, and September, though there are persons who remain there all summer; but in October we journey from Daylight Spring down hill,

mile upon mile. A sign painted upon a box lid stuck into a pile of stones gives us the cheerful assurance that we may be well provided for if we are found; it reads: "Rhyolite Undertaking Company, funeral directors and embalmers."

The canyon walls rise above us, not high, but sharp and steep, and it is only by turning and looking backward that we appreciate the greatness of the range we have crossed. The grade is easy, the road wide, sandy and gravelly, our horses grow weary and move with deliberation; all are oppressed with the feeling of weariness and lassitude.

We ride from the canyon mouth to the edge of a sandy plain, and here, 115 feet below sea-level, find a couple of holes, 5 feet in diameter and about as deep, with two feet of water in them. This is the "Stovepipe" Spring, so named from the fact that it was long marked by a section or two of that useful flue, placed upright, to inform the wayfarer where to dig when the holes had been filled by drifting sands hurled forward by the furious gales, burying deeper and deeper all vestiges of the water so necessary to life itself. We are indeed in *the* Valley; around us the sand drifts in little sheets; here and there a surface of broken and ragged saline material, hard and as rough as though made of giant saws set with teeth edge up.

We turn to the eastward; in the foreground the gritty beds of conglomerate and hard clays show as low hills backed by the ragged cliffs of the Grapevine, banded, rugged and grim. To the northward the cliffs and peaks guard this valley of desolation, the long delta fans of drift material spreading like great hands from the mouth of each canyon, burying from sight all vestige of the underlying rock, each a silent witness of the cloudbursts, which sometimes come roaring down the rock-bound clefts, to spread and evaporate like magic in the fierce rays of the sun. The farthest fan marks the mouth of Titus Canyon, named for the young Coloradan who left Bullfrog about the time we reached Goldfield, and perished in its lower reaches seeking life, as attested by the message penciled upon a sliver of stick broken from a provision box and left sticking in the sand for the guidance of his companion: "Have gone down canyon looking for the spring; have been waiting for you.—TITUS." His remains were found; those of the friend are still resting undiscovered.

Across the flat we journey, our light vehicle loaded to its limit with food, forage, and water, the mules weary before starting.

Dunes surround us, 20 to 30 feet high, representing the struggle of plant life to keep its branches above the accumulating drift and its roots near enough water. The victory is eventually with the sand, into which wheels and hoofs sink nearly a foot, or when a harder surface is found it breaks like crusted snow, letting the beasts into a soft substance which they dislike exceedingly. Through such ground we can move but a few yards without stopping.

In places great boulders obstruct the trail, among them the wagon must twist and turn through the fickle and shifting sands which often hide all signs of previous travel.

About 25 miles southward from the Stovepipe Spring, Furnace Creek flows from the lower part of a large wash which heads in the Grapevine Range. Here is one of the properties of the Pacific Coast Borax Company, which years ago constructed small irrigating ditches, sowed hay and planted trees, built houses, and established a plant for the treatment of the salts in the flat near by.

At 225 feet below sea-level are about 100 acres of emerald-like fields, long rows of fig trees, and abundant running water, while behind the frowning cliffs and sharp peaks of the Funeral Range guard the valley from the advance of the treasure-hunter from the east.

The borax plant is now idle, though the valuable beds are still owned by the company, which maintains a resident superintendent or foreman. The white flat which we saw from the mountain is

Photo by Robert H. Chapman

Plateau in Great Dry Area, Southern End of Belted Range

View from Oak Spring Butte

Photo by Robert H. Chapman

Shelter Camp in Great Dry Desert, 27 Miles from Water

composed largely of salt,* borax, and gypsum. The surface is as rough as can be imagined; it consists of ridges, blocks, and plates on edge, inclined, and flat, with shallow drains full of dreadfully salt water. From these drains the mixture of salt and other material is taken, molded into forms, and set up at various places to mark the corners of the mineral claims. This material dries out, and, when the molds are removed, stands like solid marble blocks, which remind one of the fate of Lot's wife. Here we are informed that during the summer the temperature reaches more than 130 degrees in the shade, and that the nights are too hot for sleeping, but during our visit in November the weather was beautiful except during the fierce sandstorms.

Much of the real development in Death Valley has been done by the parties interested in borax, which is found here and in many parts of the desert region. The "cotton-ball" (borate of soda) is found in the flats, but "colemanite" (borate of lime) is found in the hills and mountains, high above the flats of the valley bottoms. At one time it was attempted to refine borax at Furnace Creek, but no work of gathering or treating is now done there. The freight teams of the company bring provisions every few months. From here the now-famous 20-mule team hauled to Mojave; such teams are often seen along the lines of communication in the desert, but few have so many animals or such heavy wagons.

There is one way to become famous in Death Valley—that is, to die near to a trail so that one's remains may be found. For instance, meeting a man one day, I inquired about the route, water, etc. He said: "The road is plain for ten miles, when you'll find a well about 100 yards to the right; the water is salt, but your mules will drink it. Six miles farther you'll come to 'Tim Ryan, Aug. 9th, '05,' and two and one-half miles southeast of him you'll find plenty of good water."

From the valley where, even now in November, the temperature is between 80 and 90 during the day, we cross to the Panamint Range. At the mouth of Cottonwood Canyon we halt for lunch, having covered eight miles during the morning, and find numerous hieroglyphics on the walls. These illustrate Indians fighting over water, and depict a running stream, the bighorn sheep, and various animals and birds.

Twelve miles up this wash we find cottonwood trees, some grass, a running stream, and quantities of watercress, which the mules attack with evident relish. Here we find numerous prospectors, learn of an abandoned camp to the north, and water and trails everywhere.

In the Grapevine and Panamint ranges there are still a few mountain sheep. Tracks near water-holes and a few old skulls are the nearest we come to a view of these shy animals.

To the northward we follow along the range, often in sight of our valley camp miles away, and 48 hours after leaving the summit of the valley we are camping 9,000 feet above it, wading in snow varying from ankle to waist deep, with shoes and stockings frozen hard, the thermometer near 0°, and a cruel wind—a most trying change for man and beast.

In the Panamint Range both sedimentary and volcanic rocks appear, and near one of the contacts of these we travel up a wonderful canyon. The walls are so near to one another that on horseback one may touch both at once. The material is limestone that has been baked into marble of alternate beds of black and white, about a foot in thickness. This trail is one of the old Indian routes to the Valley from Keeler and the Sierra Nevada.

From the summits of the Panamint

*Chloride sodium	94.54
Chloride potassium	0.31
Sulphate sodium	3.53
Sulphate calcium	0.79
Moisture	0.14
Gypsum and clay	0.50
	99.81

U. S. Geol. Survey Bull. 200, p. 18.

Photo by Robert H. Chapman

In the Death Valley

Surveyor's well (65 feet below sealevel), dunes, and mesquite roots

Range we look into the Panamint Valley. Similar to Death Valley in form, but a little higher in elevation, the floor is 6,000 feet below the mountain tops and about 1,000 feet above sea.

Death Valley is by no means the driest of the regions traversed, but the heat and heretofore the inaccessibility have made it difficult. In the mountains flanking it are numerous springs and frequent water-holes which, though dry in summer through excessive evaporation, are available during the fall and winter. There are many springs that are credited as poison water; one of these we sampled, but unfortunately the bottles were broken before analysis could be made. In my opinion, there are springs in which arsenic is present, but most cases of sickness or death are probably due to drinking excessive quantities at one time, followed by physical exertion in the heat. Such springs as the Indians will not use are better left alone or used in extreme moderation, by no means an easy thing for one throat-parched and speechless for need of water. Each spring is a source of supply for flocks of birds, many of which are very tame.

The desert region is being rapidly invaded by the various transportation companies, replacing the primitive methods. The Tonopah and Tidewater Railroad is building from Ludlow, on the Santa Fe Railroad, through the Amargosa Desert, to the mines at Bullfrog, with connections to the borax mines en route. The railway from Las Vegas, on the San Pedro Railroad, to Bullfrog is under construction. These roads plan to run through to Tonopah, which will make prospecting much easier and less expensive, give a stimulus to the production and shipment of ores, and make profitable properties that would be practically valueless without them; they will lessen to a great extent the difficulties of travel. With these and other changes the desert will repay many fold those who seek its treasures of gold, silver, and lesser metals and materials.

The traveler in the deserts should be sound in heart, kidneys, and liver; have calm judgment; obtain all information possible of watering places before undertaking a journey; never leave camp without some food and water; discount from 30 per cent to 50 per cent the physical efficiency of himself and his animals, as experienced in other, cooler, fields, and abstain from alcoholic drinks, especially when doing physical labor. Many cases of collapse and death are due to alcohol or overestimation of strength.

Great mountains are a joy to the lover of nature; they are an inspiration to the artist, and express grandeur and nobility. The desert has no such spirit, but has a wonderful fascination, born of the impressiveness of magnificent distance, limitless sky, and the infinite patience of an unbreakable calm.

JAPAN, AMERICA, AND THE ORIENT*

By Hon. Eki Hioki

Chargé d'Affaires of Japan, 1905–1906

NOW that the Japanese-Russian war is ended, the world seems to be vigilantly watching the next act which will be produced on the stage of Oriental politics. Speculations of various kinds are advanced by all sorts of people. Some anticipate that the next play that Japan will put on the stage will be a peaceful comedy. Some predict that it will be the repetition of another tragedy, while others apprehend both. No doubt the power that Japan developed during the last war with Russia must have surprised the world, but that surprise of the world has surprised Japan more.

Some preach the doctrine of the yellow peril, some question the ambition of Japan, others apprehend Japan's designs upon the Philippines. Such questions as these: Will Japan adopt the Monroe Doctrine for Asia? Will she control China? Will she not beat the Americans in industrial and commercial competition? Will she not monopolize the markets of China and crowd out American goods? Will not Buddhism come into rivalry with Christianity? Will not the 700,000 Japanese soldiers, now in Manchuria, when disbanded, flood the western coast of the United States with Japanese immigration? are constantly asked on all sides.

Taken altogether, it would appear that the world is trying to ascribe to the little island empire the position of a dictatorship in the Orient. I wish such was the real position of Japan, but I must confess, to my regret, that it is too far from fact. Seeing, however, that such questions as these are receiving the more or less serious attention of the thinking class of people in this and other countries, it may not be without value to express at this opportunity my humble views on them.

(1) THE YELLOW PERIL

In spite of the influence which once it gained, the doctrine of the yellow peril seems to have practically lost hold on men's minds, at least in America. Regarding this question, therefore, I have simply to express my deep appreciation of the high intelligence and the fair spirit of the American people.

(2) JAPAN HAS NO DESIGNS ON THE PHILIPPINES

Frank and unreserved disavowals of the alleged designs of Japan upon the Philippines having frequently emanated from authoritative sources, it is superfluous for me to repeat them. But the fact that there is a constant recurrence of the same allegation in the newspapers of this country shows that the repeated disavowals from authoritative sources have born little fruit, either because the general public still distrusts Japan in this matter or because a certain section of the American people want to get up some agitation for their own interest. If a *bona fide* statement of the responsible party failed to convince them, let us try a brief argument. Laying aside entirely for the moment, for the sake of argument, the consideration of the motive of Japan regarding the present subject, let me ask you a question: Can you believe that this great American people who glory in their national spirit, in their gigantic strength, in their boundless wealth, in their marvelous development, and who look forward with proud and confident anticipation to the time when they shall be the first in the race civilization has set for man to run, would allow their flag to be lowered, be it in the Philippines or in any other place which legitimately belongs to them, by any hands

*An address delivered to the National Geographic Society, January 19, 1906.

but theirs? No; most emphatically no! That is the spirit with which you cling to your new possessions in the Pacific and that ought to be the spirit of the people who cherish honor and justice. And who can better understand that spirit of the Americans than the Japanese?

Therefore, if Japan harbored such a sinister design as is attributed to her, she must be prepared to plunge into a war far more gigantic than the one just ended, against a nation to which she owes much of what she is today and to whose people she owes that moral and financial support so unreservedly given at the most critical period in her history. No! The Philippines are not worth the sacrifice of such a valuable friendship as that of America and the enormous losses in men and money which such a war would necessarily entail. Nor is Japan in a position to carry on another costly war, except for self-defense.

Besides, the situation in the East is far more complicated than people appear to think. During the last quarter of a century the world's great events have all taken place in the East. The destiny of that portion of the world rests now practically in the hands of Japan, Great Britain, the United States, Russia, Germany, and France; and China, with her large population and territory, has not yet gained a position in the council of powers so vitally affecting her interests. When you closely scan the delicate and complicated relations of the interests of the various powers in the East, you will understand how highly Japan must regard good relations between Japan and America for her interests as well as for those of peace in the East.

(3) THE OPEN-DOOR POLICY IN CHINA

The increased prestige of Japan turned the eyes of the world toward the problem of what influence Japan will wield over China. Some people go so far as to assert that Japan will control China, proclaim the Monroe Doctrine for Asia, and drive out from the East all the White Devils and exterminate the western influences within its borders.

Without questioning either the value of the principles contained in the so-called Monroe Doctrine or its applicability to the eastern situation at present, I can simply say that such an idea has not entered into Japanese minds and such a policy has not seen even the symptoms of formation. On the contrary, the policy which has been persistently folowed by Japan in the past was to put her interests in closer and more harmonious touch with those of the western nations. For the maintenance of the integrity and independence of China, Japan joined hands with Great Britain. For securing equal opportunities in China for the commerce and industry of all nations, Japan lent her eager efforts to the United States to make the open-door policy effectively operative—the policy which was propounded by one of the foremost statesmen, diplomats, and scholars of our own day and a citizen of Cleveland, the Honorable John Hay.

While yet the war was going on a fresh treaty of alliance, much broader in its scope than the pact which it replaced, was concluded between Japan and Great Britain. One of the main objects of this alliance is "the preservation of the common interests of all powers in China by insuring the independence and integrity of the Chinese Empire and the principle of equal opportunity for the commerce and industry of all nations in China."

What proof can be stronger, what argument can be more eloquent, than this solemn document in convincing the world that Japan has no motive to close the doors of the East to the nations of the other hemisphere?

(4) JAPANESE INFLUENCE IN CHINA WILL PROVE BENEFICIAL TO THE WHOLE WORLD

It is a matter of congratulation for Japan as well as for all other nations

that there is a fair prospect of the increase of Japanese influence in China as a result of her increased prestige.

China is a vast country of twenty-six times the size of Japan in area.* Its population, which is eight times that of Japan, is described by some writers as being conspicuously marked by the absence of patriotism and cohesion and by its extreme conservatism. The government is strongly decentralized, only a feeble and limited power being actually wielded by the central authorities.

China has long remained insensible to foreign influences. She has had a number of severe trials during her long intercourse with the western nations, but all the earlier complications appear to have had the effect of making her more repugnant to western intimacy. The process of the awakening of China has indeed been long and tedious. The result of the Japan-China war of 1894 sharply stung her pride, but the effect was only temporary, and she was fast falling back to her old, sweet slumber. But the capture of Kiaochow by Germany as the price of the massacre of two missionaries; the seizure of Port Arthur and Talien-Wan by Russia; the lease of Wei-hai-wai and extension of the Kowlung concession by Great Britain; the acquisition of Kwang-Chow Bay by France, and other great events which followed in succession soon after the Japan-China war were a little too much even for the peaceful and patient Chinamen. "The worm turns," indeed. These severe stings finally aroused the patriotism of the people to such intensity that it soon degenerated into a general anti-foreign movement. The consequence was the event of 1900—known as the "Boxer Trouble"—by which China added the most unique chapter to the history of the world. The foreign legations in Peking were besieged and attacked by the regular troops of China, all the communications with the outside world were entirely cut off during nearly three months, while the interior of the Empire was swept by the same anti-foreign tidal wave.

The Powers sent expeditionary forces to Peking for the relief of their representatives and people. After a series of severe fighting, the foreign troops took possession of China's capital. The imperial family fled in confusion to Shansi, a town far out in the interior of China and beyond the reach of the foreign troops. The allied foreign forces made a triumphal march through the imperial palaces, and the city of Peking, together with the territory along the lines of communications to the sea, was placed under foreign military government. Palaces were occupied by foreign troops, looted and destroyed and the lives and property of the Chinese were placed in the most hazardous position. A joint conference of the Powers was held and the famous Peking Protocol was signed on September 7, 1901—the terms having been literally dictated. An enormous indemnity was imposed upon China and within a distance of a rifle shot from the Imperial palace, the real abode of the Great Son of Aeoru and reigning sovereign of China, a strong fortification called "Legation Quarter" was thrown up for the residence of foreign ministers and people and was strictly guarded by foreign troops.

This was a very severe lesson for China. For the first time in her history, China was made to really feel foreign influences. Reform decrees were issued one after the other. Students began to be sent abroad in search of western knowledge. China was awakening.

Just at this juncture, another dazzling event transpired in the territory of China, right under the nose of the Pekinese—that is, the Japan-Russian war. The Chinese watched this gigantic struggle with the keenest interest. The superiority of the western

*Area of—

	Sq. miles.
Japan	162,000
China	4,218,000
United States	3,507,640

method was proved to them beyond all doubt. China is now almost awake.

A large number of Chinese students are now in Japan in search of western knowledge, as it is considered by them to be the quickest and cheapest means to attain the end. Japanese institutions are copied, Japanese books translated, Japanese instructors engaged by the Chinese. In short, Japanese influence seems to be spreading quite rapidly. It is not right, however, to call it Japanese influence, because it is in reality western influence.

The present stage of China's transformation will soon pass over. The next stage will be the sending of an increased number of missions and students to America and Europe, construction of railways, improvement of water communications, introduction of machines, spread of Christianity, and the increase of the productive and buying powers of China. When 400,000,000 people begin to produce and consume the articles of foreign commerce as much as the Japanese people do today, the volume of the world's trade will be immensely augmented. Japanese influence in China is after all a westernizing influence which cannot fail ultimately to benefit the whole world.

When some years ago the Chinese customs service was organized mainly with a staff of Englishmen, the rest of the nations felt exceedingly jealous; but who ventures today to deny that it benefited the whole world? Japan cannot and will not go back to her old ways. China will not learn from Japan anything but western methods. Therefore, if Japan is now in a position better fitted to exercise civilizing influence over China, she ought to receive full support of other nations instead of their jealous suspicion.

Fears are entertained by some people that the Chinese may use the western method against the westerners. I am inclined to think that such a fear is entirely unfounded, because it is certain that the more the western influence spreads among the Chinese, the more intimate will they become to the westerners. Even should such a thing happen, nothing need be feared, for the improved means of communications of our days enable us to make ample provision for the common defense of common interests, as was done in the case of the Boxer trouble.

(5) INDUSTRIAL AND COMMERCIAL DEVELOPMENT OF JAPAN

The last war with Russia has increased the national debt of Japan to the amount of 960 million dollars—the interest of which alone requires nearly 50 million dollars annually. It is indeed a heavy, an enormous burden. And every dollar of it, interest and principal, must be paid. Japan will and must devote her full energy to her commercial and industrial development, and with the capability she has shown in the past no inconsiderable achievement can justly be expected of her new efforts. During the ten years that followed our war with China, the wealth of the nation increased more than ten times and we are now perfectly confident that we will fully recuperate from the effect of the present financial drain in due course of time. It is absurd, however, to say, as some ventured to do, that in the course of a few years American goods will be crowded out of the Chinese market by Japanese competition.

You know quite well how long it took for the United States, with all the advantages she had in inexhaustible natural resources and in better facilities for introducing foreign capital into the country, to recover from the effect of the Civil War. Japan has got to labor under an enormous disadvantage compared with the United States of that time, and it is feared that a long period will have to pass before we can put the new commercial and industrial development on a sound and vigorous condition. The apprehension enter-

tained by some section of the American people as to the commercial and industrial rivalry of Japan is more imaginary than real.

The main ground upon which rests their apprehension is the fact that Japan has cheap labor at command. That this condition should obtain an undue importance in the eyes of the people of America, where altogether peculiar labor conditions prevail, is quite natural. But before jumping to such a sweeping conclusion as that Japan will beat America in the commercial and industrial competition because she has cheap labor, it would be proper to consider the other factors which are equally, if not more, essential to the building up of a nation's commerce and industry.

Of course, everybody knows that the essential factors of industry are labor, capital, and material. Labor is only one of the three, and in our days of machinery its importance has become comparatively insignificant. The history of your own industrial progress has proved this fact. There was a time when the same cry was raised in this country as to European competition on account of their cheap labor, but where stand your industries now? Japan has labor, but the advantages which this country has in the remaining factors of industry are incomparably greater. In addition you have an immense advantage over other nations in your wonderful inventive genius. In the modern system of industry, no human labor, however cheap, can compete with machinery. Besides, labor in Japan does not remain cheap. The effect of the China-Japan war was to double the price of labor. The war with Russia must have raised it very much higher. In spite of all these disadvantages, Japan must develop her commerce and industry and she will have to compete with all the world, friend or foe. It is an absolute necessity for her very existence. But, with an unflinching determination to push her commerce and industry to the forefront, Japan will not resort to "ways that are dark and tricks that are vain." Her commercial war will be fought just as fairly and stoutly as the real war. In China, Japan seeks no unfair advantage. She seeks no favor from China that is not granted to the United States, England, or to the entire world. She stands for the open door, and, in the words of your great President, a "square deal."

Under these conditions, Japan is willing to enter either into an alliance or rivalry of trade with any nation. Japan welcomes capital and material from any country. The United States is supplying materials for our important industries. Why cannot she supply the capital, too? There exists between Japan and Great Britain a political alliance in the East; why can there not be a commercial alliance between Japan and the United States? We are willing to divide a fair share of profits, wherever gained, with any people. The field for the commercial and industrial activity of Japan has been immensely enlarged as a result of the last war, and this offers a specially favorable opportunity for American coöperation. With the cheap labor and a comparatively superior knowledge of Oriental matters possessed by the Japanese, combined with the inexhaustible supply of American capital and materials, we can build up an impregnable commercial stronghold in the East which can defy the rivalry of the world.

(6) JAPANESE IMMIGRATION TO THE UNITED STATES

It has been often asserted in newspapers that when the war with Russia is over and the army of 700,000 men now in Manchuria is disbanded, the Pacific coast will be flooded with Japanese immigration. Such a statement cannot be regarded as an expression of serious opinion, because, unless that enormous army of Japan had at once descended from the sky just for the purpose of the war, there can be no

reason why its disbandment should cause any increase of immigration to the United States or anywhere else.

Japan has no hired soldiers. Every Japanese, without distinction of class or rank, profession or trade, rich or poor, is equally under the obligation to serve three years with the colors and several years in the reserves and national guard. Therefore the Japanese army is not like that of some other countries, composed of men who were taken from among those who had no employment. On the contrary, all and every one of the men who compose that formidable Manchurian army had been taken from actual work at home, so that the effect of the sudden withdrawal of hands from the field of industry is actually being felt in the productive power of the nation.

Such being the case, even if the entire number which left Japan for the campaign returned home intact they would simply have to go back to their own work and not a single hand would remain idle. Taking into account the enormous losses suffered by our army in killed, wounded, maimed for life, and also those who would find new opportunities in Korea and Manchuria, there is every reason to believe that Japanese immigration to the United States will considerably decrease.

(7) THE FUTURE OF THE ORIENT

The Orient, with more than half of the population and more than one-third of the land area of the entire world, and with commerce amounting only to three billions of dollars annually, which is only a little over one-seventh of the total trade of the world, offers an almost unlimited field for future development. The foreign commerce of Japan, which amounted to 58 million dollars in 1880, reached 300 million dollars in 1903. The foreign commerce of China, which amounted to 217 million dollars in 1880, amounted to 355 million dollars in 1903. The growth of China's commerce was slow. She has, as I said before, 26 times the area of Japan and 8 times the population, and yet her foreign trade is only about equal to that of Japan. Should the commerce of China grow to the present rate of that of the West, that is $27 per capita, it would reach the colossal figure of $10,800,000,000, or about one-half of the world's commerce of today. What possibilities lie there in China?

The United States, which has the longest coast line on the Pacific, has entered into the oriental arena of commercial and industrial competition comparatively recently, but the prize she has already gained is remarkable. The imports of China, Japan, and Australia from all the European countries combined increased by 45 million dollars during the period of 1890-1903. During the same period, the importations from the United States alone increased by 49 million dollars, which is actually greater than those of all Europe combined. That is, the rate of increase of the European importations during that period was only about 22 per cent, while that of the United States was 160 per cent. This is truly remarkable. But the prospect for future American trade is still greater. The wonderful facilities afforded by the improved cross-continental communications, the added forces of the mercantile marine on the Pacific, the direct and independent cable connection with the Orient, the possession of the Philippines—all combine to give a tremendous impetus to the expansion of American trade in the East.

Our trade relations with the United States have been prosperous and satisfactory. In 1898 we sold to the United States 23 million dollars' worth and took from her about 20 million dollars' worth. In 1902 we sold to you 40 million dollars and took from you 24 million dollars' worth. The balance of trade has always been against the United States, but it is rapidly gaining the normal condition. In 1881, the imports from the United States formed

less than 6 per cent of the total importations into Japan, while in 1902 they formed nearly 18 per cent of the total importations. In fact, Japan's imports from the United States have grown more rapidly than her exports to the United States; and proportionately they have grown with much greater rapidity than the total importations of Japan.

The showing of American commerce during the first six months of this year is still more remarkable. The imports into Japan increased during this period by 56.9 per cent, of which 22.4 per cent belongs to this country. This extraordinary increase of importations was due to the war which is ended now, but the benefit which the trade of this country has derived and is still to derive from this cause is incalculable. The war has proved at least that this country has greater advantages over other nations in supplying the nations of the East with flour, meat, and manufactures of iron and steel and various other articles. It rests with the merchants of this country to retain this favorable condition of trade and still further improve it. That there should be this turn of the tide is only right, because the United States has been, is, and will be the best customer of Japan. No really lasting and prosperous trade can be expected unless the conditions make it equally profitable to both sides.

I repeat again that the future of the Orient is great, and the greater it is the better for the world. With peace guaranteed by the Anglo-Japanese alliance and equal opportunities in Korea and China secured by that treaty as well as by the coincidental agreement of the policies of the three great Pacific powers—Japan, the United States, and Great Britain — an important era dawned on the Orient. Let us seriously study the opportunities which the changed condition offers and harmoniously work out the way by which we can, by combining the strongest traits of each other, coöperate in developing the yet unexploited treasures of the East. During the last quarter of a century, all the great events of the world transpired in the East. For years to come, the East will still be the center of the world's great events.

THE FORESTS OF CANADA*

By Sir Wilfrid Laurier

Premier of the Dominion of Canada

IN the name of the Canadian Forestry Association, which has conceived and planned this conference, and in the name of the Canadian Parliament, which has authorized and approved it, it is my privilege and my pleasure to extend to you all a most hearty greeting. Welcome to one, welcome to all. Especially should I welcome, even after the words of His Excellency the Governor General, the representatives of the American Republic who are present with us on this occasion, and who bring to us the benefit of their knowledge and experience. Welcome also to the representatives of the provincial governments, without whose aid and coöperation our efforts could never have the full fruition which we anticipate from them. Welcome also to the representatives of the great railway companies, which are placed in a position to give, perhaps more than any other class of the community, the benefit of their experience and knowledge to us. Welcome also

*The opening address to the members of the Canadian Forestry Congress which was recently held in Ottawa.

to the representatives of the great lumbering class, who perhaps are more interested than any other class of the community in the maintenance, preservation, and protection of the forests. Welcome to the university men whom we see before us, welcome to the traders, welcome to the sportsmen; welcome to all classes who are present and who are ready to contribute of their time and of their money to the great object we have in view and which is an object of primary national importance. The large attendance which I see before me, I am most gratified to say, exceeds all the expectations that we had; and this attendance, large as it is, is a manifest evidence that the Canadian people at last realize the great importance of all problems connected with forestry.

THE PRIMEVAL FOREST

A great deal of harm has already been done—harm which, I am afraid, in many respects cannot be recalled; but it is not yet too late, and the harm which we know has taken place is and ought to be an incentive to us to do our best in the endeavor to check it and to give more attention to forestry problems. Our ancestors, when they came to this continent, found it an unbroken forest from the shores of the Atlantic Ocean to the Mississippi Valley. It was the home of a race of hunters who derived their existence chiefly from the chase and for whom, therefore, the forest was a natural element. It was the object of our ancestors to turn this land into a fit habitat for a race of agriculturists, for the white man, whose civilization is based primarily upon agriculture. They had to clear their homes from the forest; but instead of attacking the forest with care and tenderness they looked upon it as an enemy, to be got rid of with the axe, with fire, and with every mode of destruction. History tells us and our own experience tells us that they went at it most mercilessly. The forest had no friends whatever, because, to clear off a few acres of land, they would set fire to miles upon miles of the noblest trees that ever lifted their lofty heads toward the heavens. This, at one time or other, went on in every part of the continent, and even at this very day it is still going on in some parts of the continent.

These pioneers of former days, as the pioneers of these modern days, did not realize that in the economy of nature forests are just as indispensable to the civilization of man as tilled fields. They did not appreciate that, even from the point of view of agriculture, unless tilled fields are furnished by forests with moisture and rainfall, they decrease in their productiveness accordingly, and that the efforts of the agriculturist will suffer in proportion. We have assembled here in order to devise ways and means, if possible, first of all to check this evil and to make every class in the community realize the great importance of maintaining, preserving, and protecting our forests.

THE NECESSITY OF A LARGE FOREST PRESERVE

What I would like to call the attention of this convention to, in the first place, would be the necessity of establishing a preserve, a large forest domain. There are certain portions of the earth's surface which, in the wise economy of nature, must always be maintained as forests. All the hills, mountains, and plateaus which are the sources of flowing streams or rivers should never be allowed for any consideration whatever to remain anything else than forest. No consideration whatever should allow these portions of the earth's surface to be denuded of their trees. We know the consequences, and therefore it is needless for me to dwell upon that feature; it is a mere truism.

If these portions of the earth's surface in our own country are to be maintained as forests it is essential, in my humble judgment at all events, that they should form part of the national domain, that they should belong to the state. In Canada by the state I mean the provincial governments where the manage-

ment of the public lands is left to the provincial governments and the national government where the ownership of public lands is left to the national government. If it so happens, and I am afraid it has happened, that some portions of these watersheds have been alienated from the public domain and have been transferred to private ownership, it should be the policy of the national government and it should be the policy of the provincial governments to repurchase these lands and bring them back to the public domain.

THE EXPERIENCE OF NEW YORK STATE

The state of New York has inaugurated such a policy. The state of New York years ago made the mistake—I was going to say committed the folly, and perhaps that word would not be too strong—of alienating part of the watershed of the Adirondack Mountains. We know the fatal consequences that have arisen from that policy in the droughts which have, more than once, been the bane of that beautiful state. And now, I understand, the legislature of the state of New York has passed laws authorizing the administration, as fast as possible, to re-acquire these lands and make them a part of the public domain. If in any part of Canada a similar mistake has been made, a policy such as that adopted by the state of New York should be adopted here, and the national or provincial government whose business it is should make it their object to bring back to the public ownership the lands that have been alienated and make these forests a part of the national domain, as is done in Germany, France, and some other countries. (Applause.) On this point, I am sure, we all agree.

REPRODUCING THE FOREST

The next consideration for which I would invite the deliberation of this convention is the reproduction of the forests. Our system of treating the forests is to lease them to the lumbermen for the purpose of taking off the merchantable timber. I do not know whether this policy is advisable or not. I believe that on the whole it is advisable. But no effort is made to replace the timber that is taken away from what we call the limit under that policy.

In Germany and France, I understand, it is the accepted policy, a policy that has been followed for generations, when a tree is removed in any way, to replace it by the planting of another tree. (Applause.) I am not prepared to say that such drastic conditions should be imposed upon the lumbermen, though I am not prepared to say, on the other hand, that a plan of this kind should not be taken under advice. At all events, I submit to this convention that we ought to do something more than we are doing at the present time. (Hear, hear!) It is not fair to the country—it is not fair to us who are living, and still less is it fair to the generations to come after us—that we should allow the destruction of the forest to go on year by year, by the cutting down of the trees and make no effort whatever to replace what is thus taken away. The trees are a crop like any other growth. True, they are a crop of slow growth; but that is the only difference between trees and any other crop. In this, as in every case, when a crop is taken off, steps should be taken to replace it at once with another. I said a moment ago that I was not prepared to say that when the lumberman in the course of his work takes away, say, 300,000 trees in a year he should at once plant 300,000 trees; but I do ask this convention to consider what should be done in that matter. One thing might be asked, whether of the lumbermen or of the state, that where trees are taken away, trees should be seeded, so that we may have a crop coming on all the time.

THE BEAUTIFUL PINE FORESTS ARE RAPIDLY DISAPPEARING

It is a fact which we face with some degree of sadness, even to mourning, that Canada in a few years will be devoid, absolutely devoid, of the beautiful pine

forests which at one time were its pride. We can calculate the number of years, and the number is not very great, when there will not be another tree of the original forest to be cut upon the limits of the Canadian lumbermen. But trees have grown and trees ought to grow again. There is an impression, which I have heard expressed on more than one occasion, that it is useless to look for another crop of pine trees; that when you have removed the crop we found here, the growth of many years, the new crop of trees will be spreading and of no merchantable value. But I am told that there is a way whereby a new crop of trees can be grown. The growth should be started as soon as the original trees have been removed from the soil.

A few years ago I was discussing this subject with a lumberman of great authority, a man known to some of you, the late John Bertram, a man most eminent in his profession and of the highest capabilities in many directions. He told me that on his limits on Georgian Bay he had a young crop of pine which he had started a few years before. The explanation he gave me was this—and I am glad to give here the information he imparted to me, so as to gain the opinions of those who have experience in these matters—he told me that when the crop of pine was cut off, the new crop to spring up would consist largely of poplar, and the poplars grew faster than the pine or hardwood trees. And he said: If you take care to plant pine seeds underneath these poplars, the young pines will grow up, shaded by the faster-growing trees. The pines, in their efforts to reach the sunlight, will grow tall and without limbs. After a time, when they overtop the poplars, their life is assured. If this be the case, it seems to me we have here a method of reproducing our trees and of having for all time a constant supply. (Applause.) It is a natural thought that we shall not live to see this young generation of trees at their full growth; but we must not think alone for ourselves, we must think of the prosperity of Canada in the days when all of us shall be sleeping in our graves. This is the sentiment, I am sure, that actuates this entire assembly. (Loud applause.)

THE ENEMIES OF THE FOREST

The next thing I would like the convention to consider is the protection of the forest against its many enemies; for the forest, unfortunately, has many enemies. Man is bad enough, we all agree; but man is not so bad as the insects, and the insects are not so bad as fire. The fire is the great enemy of the forest. Nothing can be sadder for us to consider than that during the summer months there are miles and miles of forest destroyed by fire. This goes on every year. Speaking of my own experience, it has been going on ever since I can remember. It goes on, perhaps, not to so great an extent as in former years, but there is far too much of it yet.

I was talking a few years ago with one of the lumbermen of the city of Ottawa, and he made the statement to me that the enormous quantity of lumber taken to market out of the Ottawa Valley does not represent more than 10 per cent of the timber that has been destroyed by fire. If this is a true statement, the fact is simply appalling. Last week I met one of the lumber kings of the Ottawa Valley, who asked me, "What are you going to do at this Forestry Convention?" I said, "We are going to compel the lumbermen to protect the forest against fire." He replied, "Why, the lumbermen are doing more in that direction now than all the rest of the community put together." I said, "I quite believe it. But that is not saying very much for the lumbermen (applause and laughter), because the rest of the community does absolutely nothing to protect the forest, and the lumbermen may well be doing more without doing enough." (Applause.)

What measures ought to be taken to protect the forests against the raging fires that every year consume such an appalling quantity of the best timber of the country? I know that some effort has

been made in this direction. I know that the lumbermen keep a patrol of the woods of the Ottawa Valley, and that is a great improvement; but I submit that this is not enough. I submit that something more ought to be done, if it be only to have more patrolmen. I believe that we should have the woods patrolled as they are in Germany and France; so that, as far as possible, every incipient fire should be prevented from spreading. Moreover, we should impress every man in Canada—the lumbermen, the sportsmen, the man out of any class—with the belief that it is a crime, an absolute crime, to throw a lighted match upon the ground (applause), to scatter the ashes of a fire, or to leave a camp fire before it is absolutely extinguished. (Loud applause.) All these things are crimes, and I would go so far as to say that they should be made crimes under the law.

DESTRUCTION CAUSED BY THE RAILWAY LOCOMOTIVE

There is another mode of destruction to which I want to call the attention of the convention, and it is the destruction of the railway locomotive. The railway locomotive is a great blessing undoubtedly, and I am not here to say anything harsh of it; but if you take the train at Halifax to go to Vancouver, in every province of the Dominion where there is timber—in Nova Scotia, in New Brunswick, in Quebec, in Ontario, in British Columbia—you will see miles and miles and miles of what was once beautiful forest and which is now nothing but parched and blackened timber, a monument to the destructive power of the railway locomotive. I know that the railway men have done a great deal to obviate this evil. They have used all possible ways of overcoming the difficulty inherent to the operation of the railway locomotive. They have put screens upon their stacks, they have devised different methods, but all these methods have been inadequate and I do not know that in that direction they can do more than they have done; but perhaps the railways ought to be compelled in the summer season, at all events, to have extra patrolmen on their tracks so as to prevent incipient fires, to follow sparks in their progress, and to extinguish them before they have caused any damage. I think that is one question that ought to be carefully considered by this convention, and I believe that if it were to do nothing more than to prevent fires by railway locomotives, this convention would have done a great deal; but I think it will do more than that.

GOOD EXAMPLE OF MANITOBA AND SASKATCHEWAN

There is another subject to which I would also invite the attention of the convention. That is tree planting. It is not sufficient that we should preserve our forests where we have forests. It is not sufficient that we should plant forests also to a great extent, but we should invite people generally to give more attention to tree planting at their homes and especially upon their farms.

The Canadian government some eight years ago introduced into one of its departments a forestry branch. It has done a great deal of good in that respect, and I hope that Mr Stewart, who is the administrator of this branch, will give us some information as to the work which he has done. It has done a great deal already, to my certain knowledge and to the knowledge of every one who has been in the Northwest.

It was my privilege last September to visit the Province of Manitoba and the new provinces of Saskatchewan and Alberta. Fourteen years had elapsed since I had seen them before, and of all things which struck me in this wonderful country the thing which perhaps gladdened my heart more than anything else is the attention which is given to forestry. Fourteen years ago, when I first visited the Province of Manitoba and the territories of Alberta and Saskatchewan, the farms were absolutely barren of trees; you could not see a tree around them. Now I am glad to say that around most of the farms of Manitoba and many in

Saskatchewan and Alberta you can see groves of trees. The city of Winnipeg in that respect is an example to the cities of the east. The city of Winnipeg has done marvels in the way of tree planting. The streets of Winnipeg today are a credit to that city and would be a credit to even an older city than it is. But there is a great deal to be done in the east, and in that respect perhaps my own Province of Quebec is the greatest sinner.

My own countryman, the French Canadian, is the man with the axe. There is no better man in that respect than he. He goes into the forest, and there is no man who can equal him in forest work; but in the meantime he has not been as careful as he should have been in preserving the trees in his midst. I should like to impress upon every Canadian farmer the necessity of covering with trees every rocky hill and the bank of every running stream. It is very easily done. He has only to scatter the seeds on the ground, fence it, and nature will do the rest.

These are some of the questions which I hope will be taken into consideration by yourselves. I do not intend to limit the number of questions which shall be taken into consideration, but these are some to which, with others, I invite the serious attention of this convention.

THE VAST TIMBER BELTS OF CANADA

A RECENT report on the forests of Canada by U. S. Consul Henry S. Culver, at London, Ontario, gives the following summary of their great dimensions:

There are three great timber belts in the Dominion: The northern or spruce belt, the southern or commercial belt—both east of the Rocky Mountains—and the British Columbia belt, west of the Rocky Mountains. These belts do not include, however, the forests of the maritime provinces, which are extensive and valuable, covering about one-tenth of the area of Ontario and Quebec, or the forests of New Brunswick and Nova Scotia, which may be compared in a general way to those of Maine.

FORESTS OF BRITISH COLUMBIA

The western or British Columbia belt is far superior to either of the eastern areas, for the reason that the climate, tempered as it is by the warm waters of the Pacific Ocean, promotes a more perfect growth and development of the different species. Here is found not only the valuable red fir or Oregon pine, generally distributed throughout the entire province along the coast and on the mountains, but also the red cedar, the western spruce, the yellow cedar, the hemlock, the balsam fir, the western white pine, the western yellow pine, the maple, and the western oak in such quantities as to make this the most valuable timber belt on the North American continent. This belt extends from the forty-ninth parallel north to the sixtieth parallel, a distance of some 770 miles, and is from 200 to 300 miles wide. The best timber does not extend to the extreme north. That portion is covered with black and white spruce, and constitutes a very extensive pulp-wood range.

But this region, because of its great distance from the markets in the East and the lack of cheap transportation, will remain comparatively in its primeval state until the eastern forests are nearly exhausted or until better transport facilities are afforded.

THE NORTHERN FORESTS

The northern belt is perhaps greater in extent than all the other timber belts and reserves of Canada combined. According to the best authority, it extends from the eastern coast of Labrador north of the fiftieth parallel in a northwesterly

direction to Alaska, a distance of some 3,000 miles, with an average width of perhaps 500 miles. This vast strip of timber land, if placed upon the territory of the United States, would extend from Maine to California and from the southern shore of Lake Erie to the northern boundary line of Georgia. It is known as the spruce forest of the Dominion, the great bulk of the timber being of that species, black and white, the other important trees being larch and poplar.

Although this belt has been but partially explored, it is claimed that many of the trees in the southern portion are of a lumber-producing size, but the greater portion is fit only for pulp.

When it is considered that spruce is distributed in vast quantities through all the forests of Canada, and that an almost incalculable amount will be produced in this great northern belt, it is hardly exaggeration to say that the Dominion possesses an inexhaustible supply of pulp wood.

Dr Robert Bell, Director of the Geological Survey of Canada, says of the area of the forests:

"The area of our northern forests may be reckoned as forty-four times as great as that of England. Any one of these forty-four parts will produce wood enough to supply the ordinary demands of the present population of Canada—that is, 5,000,000 people could get what is required for mining, fuel, etc., by taking the timber from a space the size of England—and would be able to allow the other forty-three equal parts to be in reserve or used for export."

The railway being built from Sault Ste. Marie to Hudson Bay will make available the timber growing around the bay and along the line of the road, and may possibly provide a more accessible field of pulp wood than can be obtained in any other way for the rapidly growing industries of the Soo.

THE SOUTHERN BELT

The southern or commercial timber belt spreads over a very wide territory. It comprises that portion of Ontario and Quebec lying between the forty-fifth and fiftieth parallels of latitude and bounded on the east by the St Lawrence River and on the west by the Great Lakes and Manitoba. Great interest centers in this great timber region by reason of its proximity to the manufacturing centers of the United States and because it contains the most valuable timber for lumber east of the Rocky Mountains.

It is not, however, a compact and unbroken belt of first-class timber. Climatic conditions seriously interfere with the development and growth of some of the best species of timber that inhabit this region, for none of the best ones extend farther north than the watershed between Hudson Bay and the Great Lakes, approximately the fiftieth parallel of latitude, and many of them find their northern limit far south of this parallel. The composition and extent of this timber belt can be better understood by taking a map of the Dominion and tracing its boundaries and noting the northern limit of the most valuable species. The forty-fifth parallel cuts out entirely one very valuable species—the black walnut—whose northern limit of growth is the latitude of the city of Toronto, while a few miles north of this parallel is the northern limit of red cedar and white oak. A line drawn from the city of Quebec to Sault Ste. Marie will designate the northern limit of beech, while a line drawn from the northern part of New Brunswick to the north shore of Lake Superior will mark the northern boundary of sugar and hard maple. Two other species which have their northern limit within this belt are elm and birch.

The king of the northern forests is white pine, which has its northern limit, as have also white cedar and red pine, at this fiftieth parallel of latitude. This region is now virtually its only home in the Dominion of Canada. It was at one time supposed that it had a very extensive northern range, but Dr Bell states that its distribution is comparatively southern, very little being found north of the fiftieth parallel.

This belt would furnish an enormous

supply of excellent timber but for the destruction wrought by forest fires.

Dr Bell calculates that about one-third of this territory may be considered as under a second growth up to about 10 years of age, one-third as intermediate, and one-third including trees of 100 years or more, and this applies doubtless to all the forest areas of Canada; to this particular belt, which lies at the very doors of the great manufacturing establishments of the United States, and is the one foreign timber region upon which we rely, the available supply of first-quality timber is alarmingly limited.

The Canadian forests have never been called upon to pay the enormous tribute to multiplying industries that our forests have; but they have been decimated by the speculative lumberman and the improvident settler, and ravaged by fire until those forests which are most accessible bear little resemblance to their primeval state.

But it is not too late for the Canadian people to preserve what is left of their great timber reserves, and by a vigorous and judicious system of reforestation they may be able to meet every demand for their best timber for a long time to come. They are awake to the responsibility, and are taking measures to preserve what is left and to reforest the waste places.

ANIMAL WEALTH OF THE UNITED STATES*

WITH AN EXPLANATION OF SOME OF THE REASONS OF ITS PHENOMENAL DEVELOPMENT

By Hon. Francis E. Warren

Senator from Wyoming

CONGRESS has had much to do and the press of the country and the people much to say of late about live stock and the products and manufactures therefrom.

The newspapers and public men of certain States have aggressively demanded "free raw material"—so called, erroneously—such as free wool, free hides, free coal for manufacturing same, etc.; and the excitement in one State at one time reached a point where a candidate for governor was in wide difference through the public press with the President of the United States as to sentiments entertained and expressed upon this subject.

Still later, from the White House and by Executive direction has followed an inspection of certain features of the live-stock industry, the result of which has surprised the nation.

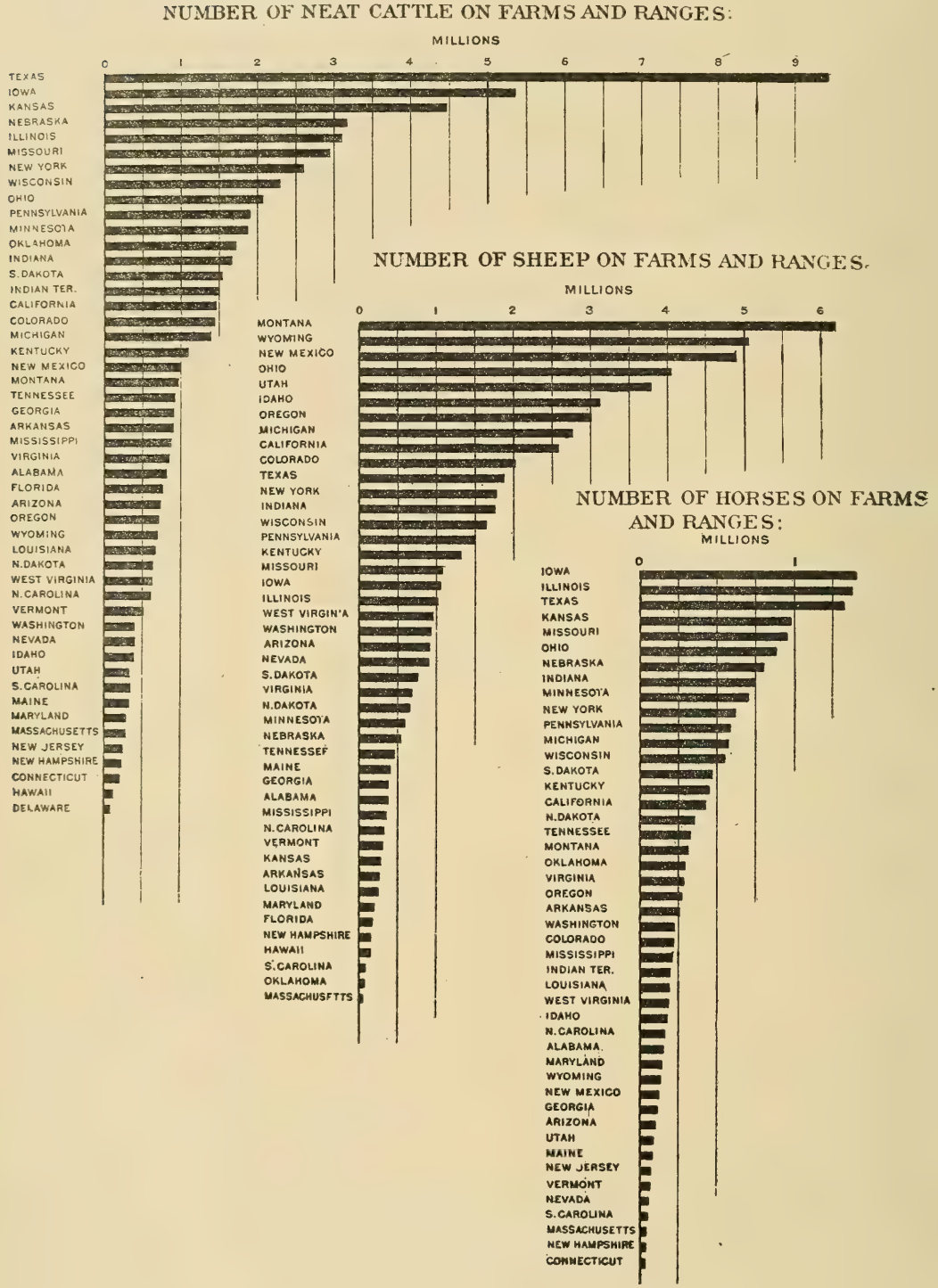
The Twelfth Census reports, covering a period of collection and compilation of over six years ago, indicated that the live-stock industry, even at that time, was the largest of all the industries in the United States, and a statement of the industry as it exists today would show that it maintains its supremacy and is deserving of the most careful and important consideration by Congress and the American people.

In the United States, in 1899, the Bureau reported.

Domestic animals, value, $2,981,722,945.

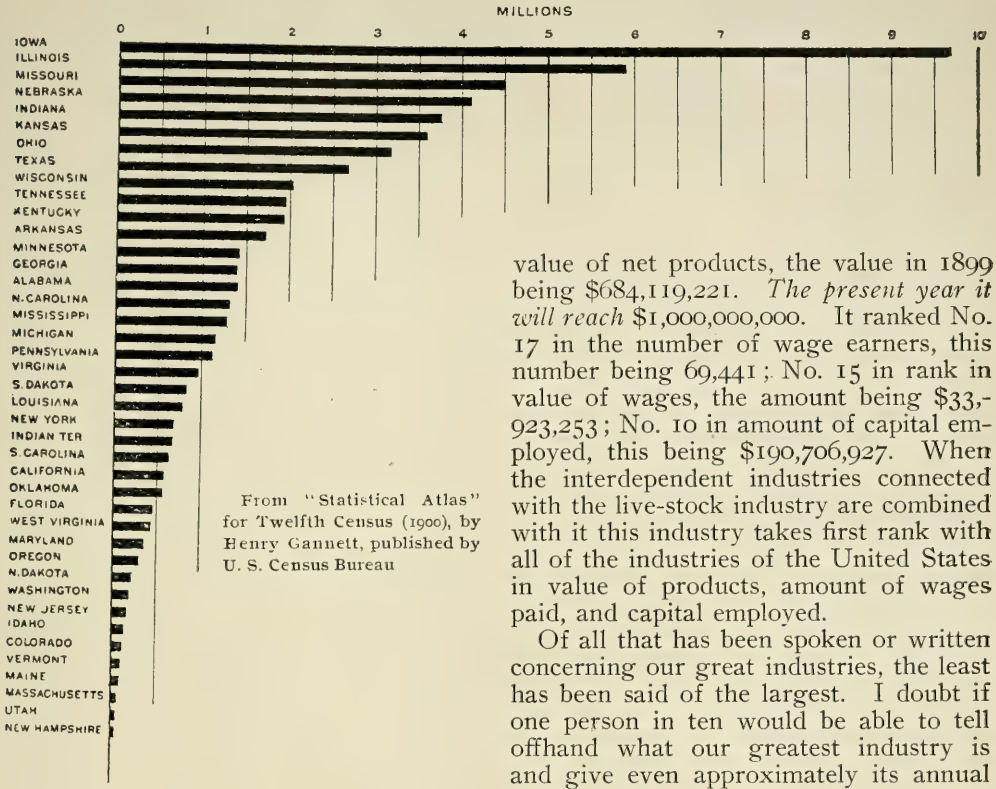
	Number.	Value.
Neat cattle	67,822,336	$1,476,499,714
Horses	18,280,007	896,955,343
Mules	3,271,121	196,812,560
Sheep	61,605,811	170,337,002
Swine	62,876,108	232,027,707
Goats	1,871,252	3,266,080

* This article is the substance of a speech delivered in the United States Senate June 27, 1906.



From "Statistical Atlas" for Twelfth Census (1900), by Henry Gannett, published by U. S. Census Bureau

NUMBER OF SWINE ON FARMS AND RANGES.



From "Statistical Atlas" for Twelfth Census (1900), by Henry Gannett, published by U. S. Census Bureau

The number of persons engaged in the live-stock and interdependent industries at that time was:

In agricultural pursuits	10,381,765
Stock raisers, herders, etc	169,976
Butchers	113,193
Meat packers	13,776
Leather and its products	557,401
Candle, soap, and tallow makers	4,020

A total of 11,240,131 persons, whose livelihood was dependent directly and indirectly on the live-stock industry, or 38 per cent of our entire working population.

THE GREATEST OF OUR INDUSTRIES

The incidental branch of the live-stock industry, that of slaughtering and meat packing, not including retail butchering, ranks No. 1 in all of our industries in value of net products, the value in 1899 being $684,119,221. *The present year it will reach* $1,000,000,000. It ranked No. 17 in the number of wage earners, this number being 69,441; No. 15 in rank in value of wages, the amount being $33,923,253; No. 10 in amount of capital employed, this being $190,706,927. When the interdependent industries connected with the live-stock industry are combined with it this industry takes first rank with all of the industries of the United States in value of products, amount of wages paid, and capital employed.

Of all that has been spoken or written concerning our great industries, the least has been said of the largest. I doubt if one person in ten would be able to tell offhand what our greatest industry is and give even approximately its annual value. Some would say our iron and steel production, with its more than $1,000,000,000 worth of yearly output. Others would say our textile industry is the largest; and yet our woolen, cotton, silk, and linen goods combined do not equal our iron and steel products. Others would perhaps say our mineral products, which in 1904 amounted in value to $1,289,000,000. Some might think our building industry the greatest. Some would no doubt say our lumber and timber products, and others our flouring and grist mill products. Some might say our freight traffic or total railroad earnings of about $2,000,000,000. But they would all be wrong, for, as I have already indicated, the one branch of industry under consideration is greater than any of the others I have named, and it far exceeds any other single agri-

cultural or manufacturing pursuit in which our people are engaged.

Of course, I refer to the raising, slaughtering, and distribution of animals and animal products. That it may be seen how this compares with other great industries, I present the following table of figures taken from the census of 1900:

Value of Products, Census of 1900.

Carpentering	$316,101,758
Clothing (men's)	159,339,539
Cotton goods	339,200,320
Flouring and grist mill	501,396,304
Foundry and machine shop	644,990,999
Iron and steel	596,689,284
Lumber and timber	555,197,275
Printing and publishing	347,055,050
Woolen and worsted goods	296,990,484
Slaughtering and meat packing (not including retail butchering)	785,562,413

In 1905 the census returns show the value of products of slaughtering and meat packing alone, and not including retail butchering, to have reached the enormous sum of $913,914,624. But in addition there were 113,193 butchers engaged in retail butchering to a greater or less extent, whose products would swell the above figures to at least $1,500,000,000, for it must be remembered that the great packers reship about 40 per cent of their live stock. Then there are about 6,000,000 farmers whose product, if each slaughtered only $100 a year on the average, would amount to $600,000,000. So that it is a very conservative and low estimate to say that the annual product of our animal industry exceeds $2,000,000,000 in value.

This is many times the value of all the gold produced in the world in 1903. It is nearly as much as all the gold produced in the United States during our whole history.

RELATION OF RAW MATERIAL TO FINISHED PRODUCT

Let me at this point call attention to the most significant feature of this industry, namely, the value of the so-called raw material. The cost of material used in the iron and steel production of 1900 was $390,563,117; in the foundry and machine-shop products, $286,357,107; in cotton goods, $176,551,527, and in other great industries the cost of material runs from less than one-half to about three-quarters of the value of the finished product, while in the slaughtering and packing industry the cost of raw material in 1900 was $683,583,577, or about seven-eighths of the value of the final product.

It is chiefly of this material that I shall speak today, and I propose, Mr. President, to confine myself for the most part, in the brief remarks I shall make, to one branch of the great industry, namely, cattle and cattle raising.

SHEEP AND WOOL

Much attention has been given in the past to our sheep and wool industry. It has been attacked by free-traders and defended by protectionists. We have tried free wool and seen our flocks disastrously shrink in number and value.

Let me make but a single comparison. In 1893 our sheep numbered 47,273,553 and were worth $125,909,264. In 1897, after more than two years of free wool, our sheep numbered only 36,818,643 and were worth only $67,020,942, or but a little more than one-half their value of the four years previous. On January 1 of this year, under protection, in spite of the great demand for lamb and mutton, we had 50,631,619 sheep, and their value was $179,056,144, or nearly three times their worth under a free-wool tariff.

VALUE OF FARM ANIMALS UNDER FREE TRADE AND TARIFF

On January 1 of this year our farm animals were valued at $3,675,389,442, as compared with a valuation of $1,655,414,612 on January 1, 1897, the last year of the Gorman-Wilson tariff. Let me now give the figures for several years showing the number and value of milch cows, oxen, and other cattle. They are taken from the Statistical Abstract, as follows:

Herd of Cattle on the Summer Range

January 1—	Oxen and other cattle.		Milch cows.	
	Number.	Value.	Number.	Value.
1890	36,849,024	$560,625,137	15,952,883	$353,152,133
1891	36 875,648	544,127,908	16,019.591	346,397,900
1892	37,651,239	570.749,155	16,416,351	351,378,132
1893	35.954,196	547,882,204	16,424,087	357,299,785
1894	36,608,168	536.789,747	16,487,400	358,998,661
1895	34.364,216	482,999,129	16,504.629	362,601,729
1896	32,085 409	508,928,416	16,137,586	363,955,545
1897	30,508,408	507,929,421	15,941.727	369,239,993
1898	29,264,197	612,296,634	15,840,886	434.813,826
1899	27,904,225	637,931,135	15,990.115	474,233,925
1900	27,610,054	689,486,260	16,292,360	514,812,106
1901	45,500,213	906,644,003	16,833,657	505,093,077
1902	44,727.797	839,126.073	16,696,802	488,130,424
1903	44,659,206	824,054,902	17,105,227	516.711,914
1904	43,629,498	712.178,134	17,419,817	508,811,489
1905	43,669,443	661,571.308	17,572,464	482,272,203
1906	47,067,656	746,171,709	19,793,866	582,788,592

It will be seen that the cattle of January 1, 1897, numbered 46,450,135, while on January 1 last they numbered 66,861,522, a gain of 44 per cent. The value of these cattle was $877,169,414 on January 1, 1897, and $1,328,860,311 on January 1, 1906, a gain of 51 per cent. The average under the Wilson-Gorman tariff was about $860,000,000, while the average value under the Dingley tariff has been $1,237,000,000.

Coming now to the cattle slaughtered, I will give the number received at five western markets during 1895 under the Wilson-Gorman tariff, and 1905 under the Dingley tariff.

Number of Cattle Received at Markets Named

	1895.	1905.
Chicago	2,588,558	3,410,469
Kansas City	1,613,454	2,180,491
Omaha	586,103	1,026,392
St Louis	851,275	1,254,236
St Joseph	49,203	501,200
Total	5,688,593	8,372,788

A gain of 47 per cent.

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A Half Mile of Pork

Scene in a large Chicago packing-house

It is probable that this gain per cent was fully maintained at the many smaller markets throughout the country, and as the gain in value was much greater than the gain in number, the cattle raiser has been doubly benefited under our present tariff law.

The present duty on cattle, Mr. President, is none too large for the protection of our farmers and cattle growers. The plea is made that the duty only benefits the so-called "meat trust," and enables the packers to control the price of meat, which we know is greater than it was ten years ago. I do not propose to either condemn or defend the so-called "meat trust." I simply want to assert that the duty has nothing to do with the retail price of meat, save in so far as our tariff, in giving more employment and more wages to consumers, creates a demand for meat far in excess of previous years and far in excess of the demands of any other people. I have shown that the value of cattle has increased over 50 per cent since the Wilson-Gorman tariff.

Meat in the United States, under protection, is less in price than in Great Britain under free trade. Beef, according to the prices furnished by the New York Produce Exchange, was 20 to 25 per cent higher during 1905 than during 1895. But corn and hay and labor were more than 25 per cent higher. If the packers do control prices, and if they could import cattle from Mexico, Canada, and other countries duty free, then who would benefit? We would have to pay the same price for beef, and the packers would pocket the difference. They would then compel our farmers and cattle growers to meet the foreign price, depressing the domestic industry, reducing cattle prices, and then hold us at their mercy as regards prices for retail consumption.

SOME EXPERIENCES UNDER WILSON-GORMAN ACT

In this connection I want to give you our experience under the Wilson-Gorman tariff. Under the tariff of 1890, known as the "McKinley law," the duty of $10 per head on cattle over a year old was practically prohibitive. With the repeal of that law and the reduction to 20 per cent ad valorem under the tariff of 1894 importations of cattle were resumed. Let me give you a few sentences from the testimony of Representative Noonan, of Texas, before the Ways and Means Committee of the Fifty-fourth Congress, January 5, 1897:

> The present tariff has practically placed horses, cattle, sheep, and goats on the free list, and it has resulted in great loss to the breeders of stock, many of whom have been bankrupted. Numerous ranches have been abandoned or have gone into decay, and millions of acres of good grazing lands are unused and the grass wasted because the business does not justify stockmen in raising animals for market at present rates. As a consequence all of their industries are languishing from the effects of Mexican competition. Nearly half a million of cattle have been imported from Mexico into the United States through Texas ports since the repeal of the McKinley law. The ranchmen of Texas are unable to sell their stock at the price paid for the Mexican cattle. Texas cattle raisers are required to rent or buy land upon which to graze their cattle, and they are obliged to pay more than double the wages paid in Mexico. Hence citizens of Texas are almost a unit against the importation of these Mexican cattle. At least 95 per cent of the cattlemen in Texas are opposed to the present duty and are in favor of the restoration of the McKinley rate. The tariff once restored—a specific tariff and one sufficient to protect their interests—the old abandoned ranches will at once be reoccupied and our people will again be remunerated for their expenditure and labor, and the prosperity they have yearned for will return.

Our farmers and cattle raisers want protection for their product, and we should be wronging every one of our agriculturists and those depending on them by lowering the present duty. The benefit is far reaching, as can be seen by the fact that of the 325,000,000 bushels of corn produced in Nebraska in 1905, half of it was fed to cattle; the same ratio undoubtedly holding good for Iowa, Kansas, Missouri, and other sections.

The tariff on cattle protects and benefits nearly one-half of our people as producers or dependents, and it does not affect the price of meat to the consumer.

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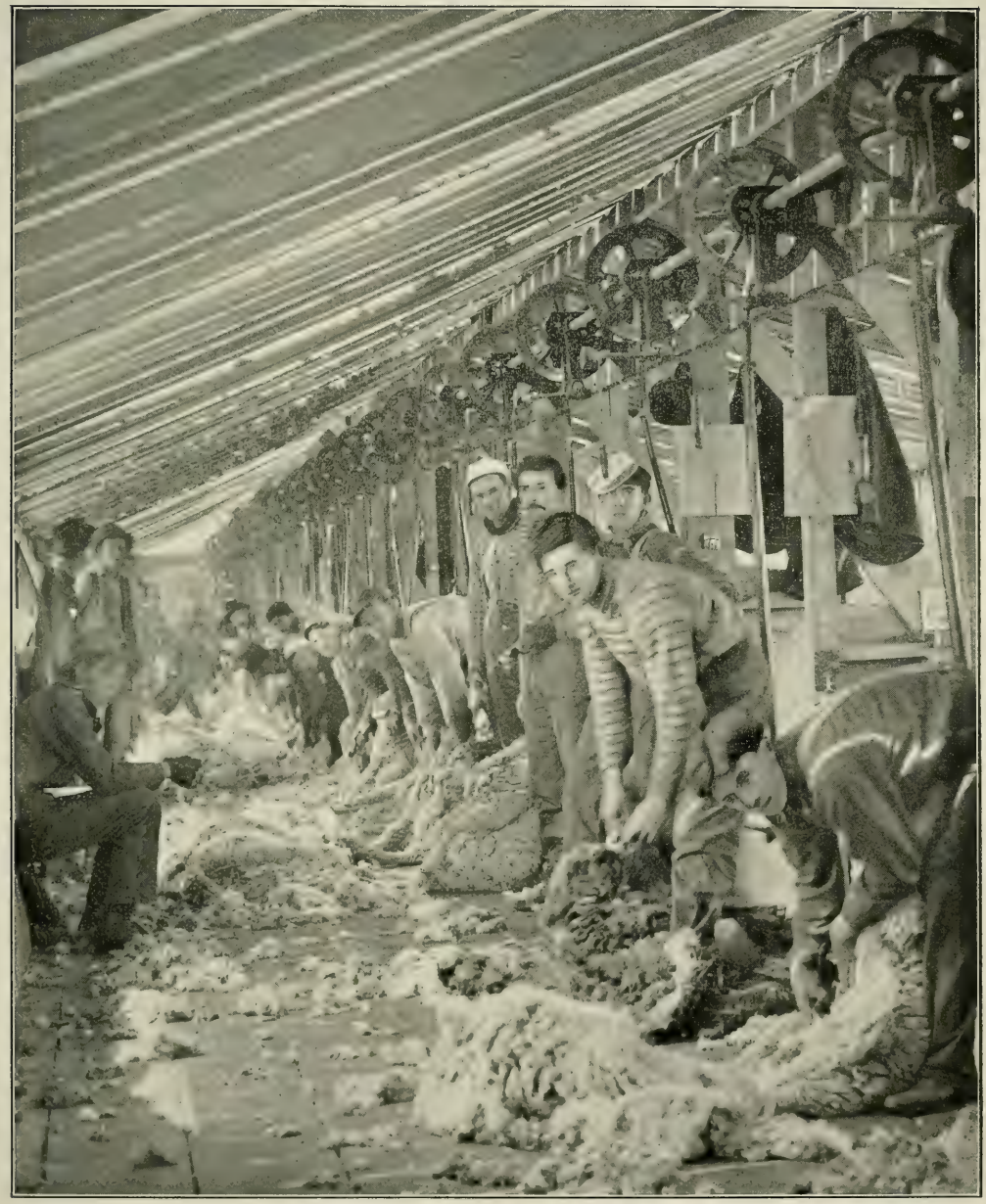
A Thriving Family

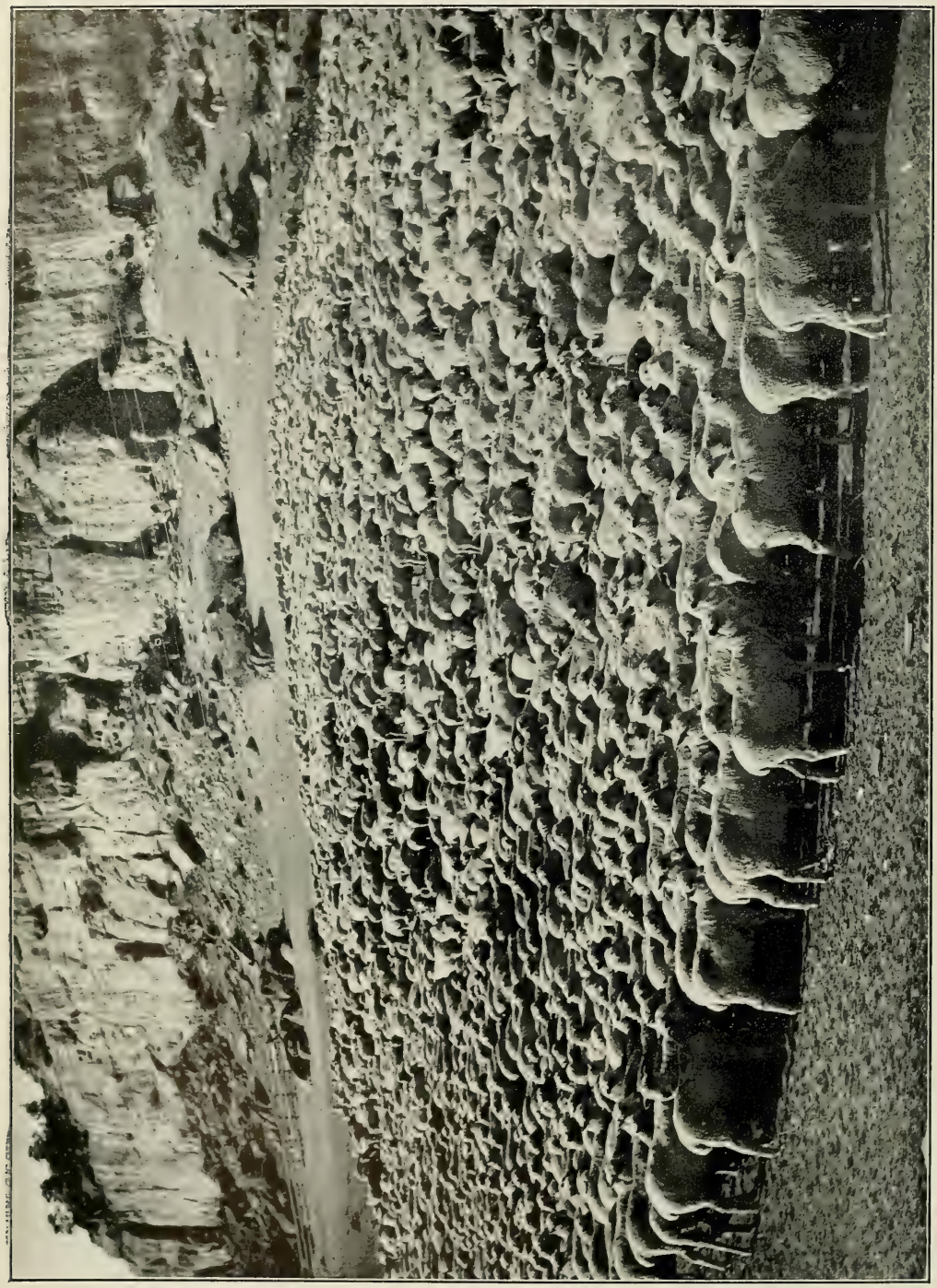
FINISHED PRODUCT OF OTHER INDUSTRIES PROTECTED

Let me now briefly explain why the cattle grower should benefit and why this branch of his industry should be protected. In the first place, the finished products of other great industries, of which his finished product is the raw material, has greater protection, larger duties, than his own. It is estimated that of 1,000 pounds of live stock, 550 pounds become dressed beef, leaving 450 pounds of non-edible material. This latter is converted into so-called "by-products," the science of converting which has made such progress that there is today practically no waste whatever of this 450 pounds of non-edible material, but, instead, 120 different products, all more or less valuable, are secured. So important and interesting is this phase of the subject, that I wish to quote the following from a recent article:

> Once the 450 pounds of non-edible material was largely thrown away, although the hide and tallow were utilized. Later, some of the waste products were used in the manufacture of glue. Nitrogen being the chief element in plant food, and this being abundant in the great mass of refuse matter originally thrown away as hopeless waste from all the packers' processes, a most important economic advance was made in the step which turned this large volume of scrappage into fertilizer.
>
> It is good sense and for the best interest of the world that all material not needed to feed, clothe, and heal the world should be returned to the ground for food for plants, to grow more grain, to feed more cattle, and to feed more people. That is the circle completed by the packer.
>
> All the cunning of the chemist has been



The Modern Method of Sheep Shearing with the Aid of Clipping Machines



Band of Four Thousand Wethers Ready to Ship to Market near Billings, Montana

called into service to save, to make the most of every scrap of material in the land, and to discover new ways in which some elements of waste may be diverted from uselessness to use. Hundreds of valuable products are now made and shipped all over the world from materials which under old methods had little or no value. Thousands of people are employed in manufacturing these products. The technical schools are constantly being called upon for young men to aid in solving new problems in by-product utilization. New plants are being built requiring material, machinery, and labor in construction. Success in by-product utilization in the packing industry has directed the attention of other industries in this important element in industrial administration.

All this directly affects the people and has been of great benefit to them. The investigator in medicinal and other lines is constantly calling upon the packer for material to aid him in his work. In the pharmaceutical line much has been done of benefit, and many ills are helped by pharmaceutical preparations of animal origin. In the fertilizing line many sections are given over to growing products which could not be profitably grown without the use of fertilizers. The upland-cotton section of the South has been made by the use of fertilizer in the growing of cotton. Sandy soils in sections climatically favorable have been developed into large truck-farming districts through the use of fertilizers, as the soil without fertilizers is practically sterile.

The furniture of the country is glued with the packers' glue. A great deal of wool used in clothing is from the sheep slaughtered by the packers. One of the largest sources of curled hair is the switch from the tails of cattle. A large portion of the soap manufactured comes from the tallows and greases prepared by the packers. The colors in the summer prints worn by women are largely fixed by the use of albumen prepared by the packers, as is also the finish on many of the fine leathers. The horn comb, hairpins, and buttons are made from the horns of steers. The knife handle, the bone button, and many other articles are made from hard bone of cattle.

Researches by scientists of the first class are employed every day by physicians, surgeons, dentists, and chemists throughout the world. More than thirty recognized therapeutics agents of animal origin are produced in Armour & Co.'s laboratory. Among them are the pepsin and pancreatin that physicians use in treating digestive disorders. There is a product of the thyroid glands that is employed in treating cretinism or idiocy. Another is suprarenalin, used in the most delicate surgical operations to stop the flow of blood. To illustrate how closely the by-product feature of the business is gleaned, the suprarenal glands of more than 100,000 sheep are required to produce 1 pound of suprarenalin, and when produced this suprarenalin is worth more than $5,000 a pound.

Certain by-products of the packing plants are used for hardening and for coloring steel. In fact, materials of animal origin, the result of by-product utilization, enter into the manufacture of almost every article extensively.

Most of these by-products are protected, and the farmer and cattle grower buy them back and consume them more largely than any other class of people. It is fair and equitable to them that they should have a compensating duty on their own products. I will endeavor to illustrate this fully in the case of the principal by-product of cattle—hides.

Some of the manufacturers of boots and shoes are particularly insistent upon a repeal of the duty on hides. And yet they never were so busy or so prosperous as they have been under the operation of the present tariff. I wish to give the figures showing our exports of cattle, leather, and boots and shoes for the two years 1895 and 1905, the former under free trade, the latter under dutiable hides of cattle.

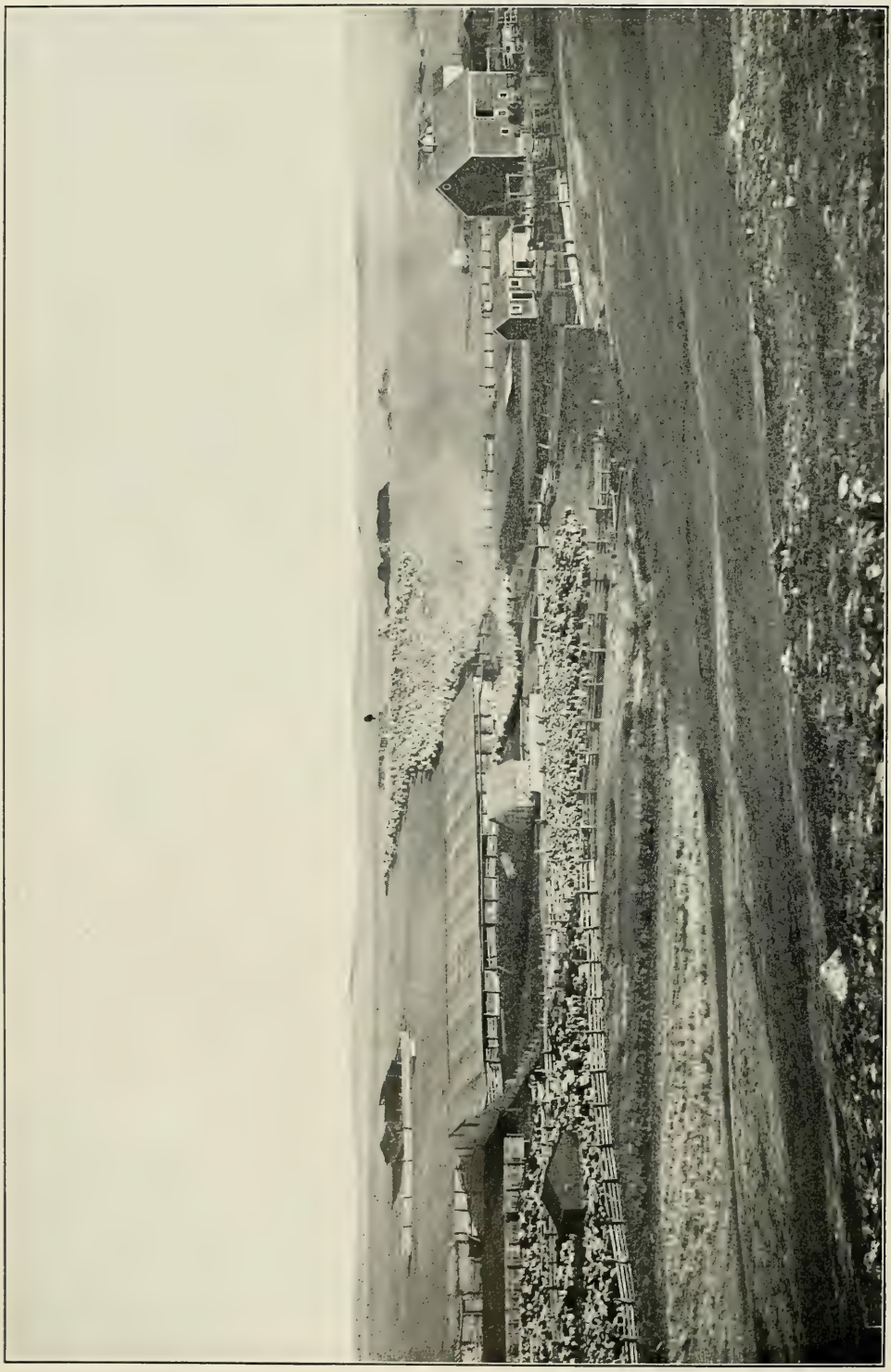
Exports of Cattle, Boots, Shoes, and Leather

Article.	1895.	1905.
Cattle.....number...	331,722	567,806
Cattle .....value...	$30,603,796	$40,598,048
Boots and shoes...number pairs...	822,412	5,315,699
Boots and shoes.....value...	$1,010,228	$8,057,897
Total leather and manufactures of.....	$15.614,407	$37,936,745

UNITED STATES EXPORT OF BOOTS AND SHOES INCREASED 500 PER CENT.

It will be seen that our exports of cattle increased about 25 per cent; our exports of all leathers and manufactures of about 150 per cent, and our exports of boots and shoes over 500 per cent in number and 700 per cent in value.

Great Britain has had free trade all these years and cheap labor, and yet, though twelve years ago she exported more than twelve times the boots and shoes we did, we have caught and passed her in this, as in about everything else. *We have, under dutiable hides, become*



Sheep Ranch near Billings, Montana. Twelve Thousand Sheep in this Picture

the leading exporters of boots and shoes, in spite of the fact that the average price per pair is $1.52, as against 95 cents for those exported from Great Britain, and about all of this difference goes to the American workman.

A TENFOLD INCREASE

But the great increase in exports of leather, and particularly in boots and shoes, does not compare with the increase in output for domestic consumption. This is shown in the product of the manufactories of Massachusetts, where the increase of value of shoes made was $70,271,966 in 1905, as compared with 1895, when the increase over 1885 was only $7,405,548. *A tenfold increase* does not look as if the Massachusetts shoe markets were being injured by a small duty on a portion of their material.

No wonder that Governor Guild and the Boston papers can boast of the great prosperity of Boston and vicinity. Here is a recent extract from the Boston *Globe:*

> Boston is the center of the wealthiest and best purchasing community in the country without any exception whatever.
>
> In the purchasing ability of the average person Boston is far ahead of all according to the national census.
>
> Per capita wealth of the people of Boston, $1,942; New York, $1,337; Philadelphia, $1,127; Chicago, $1,016; St Louis, $918.
>
> One-twentieth of the wealth of the United States is within 50 miles of Boston.
>
> One-fifth of the savings of the people of the United States is in the Massachusetts savings and coöperative banks to the credit of Massachusetts depositors.

GOVERNOR GUILD ON MASSACHUSETTS PROSPERITY

Governor Guild said in his annual address to the legislature of Massachusetts last January:

> Massachusetts, fourth from the foot in area, is seventh from the top in population, fourth from the top in the annual value of her manufactures, and third from the top in the annual amount paid in wages. Measured by assessed valuation of the property in her borders, Massachusetts is exceeded by but two States. Fourth from the foot in area, Massachusetts is third from the top in wealth
>
> The annual value of the manufactured products of Massachusetts increased by but $175,173,033 between 1885 and 1895. It increased by $300,267,558 between 1895 and 1905. The total value of goods made in Massachusetts was $1,150,074,860 in 1905.
>
> On October 31 the total amount on deposit in our savings banks was, in 1885, $274,998,412; in 1895, $438,269,861, and in 1905, $662,808,312. The increase in the last decade was greater by over $58,000,000 than in the decade that preceded it. In 1885 the average deposit for each person of population was $141.64; in 1895, $175.69, and in 1905, $220.67. The gain in deposits per capita in the last decade was greater by nearly one-third than the gain in the preceding decade.

We do not envy Massachusetts her great prosperity. We all rejoice in it.

With free hides, during the three or four awful years the result of the Wilson-Gorman tariff on general business, cattle hides on the ranges of Western States, such as Wyoming, were not worth the taking off. In killing beef the hides had necessarily to come off, but even then they were thrown aside and never shipped, because the railroad freight charges alone amounted to more than the hides would fetch in market, and so they were thrown aside by the thousands and rotted where thrown; whereas now, in these same States, with railroad charges equally as high, each hide brings several dollars and adds just that much to the worth of every head of cattle.

DUTY ON HIDES A GENERAL BENEFIT

The duty on hides has been of general benefit and of injury to no one. Neither manufacturers, merchants, nor workingmen have been affected adversely by the operation of the duty; on the contrary, all have been benefited through increased employment, increased wages, and increased sales, while the cattle grower has certainly benefited by a larger sale of his product at profitable prices. I do not deny that the duty increased the price of hides somewhat, but the increased value is of slight moment in the cost of each pair of shoes, but is of much concern as to each cattle hide.

But suppose we had free hides and free shoes; what would be the result? We should soon have millions of pairs of cheap shoes dumped on our market. The material being the same, the foreign manufacturer with his low-priced labor—a labor costing one-half or one-third of ours—could close our factories or else compel our laborers to work for starvation wages. The purchasing power of the 200,000 persons now making shoes would be cut in half or disappear altogether, and so much of our home market would be lost to the farmer and other manufacturers. We have had just such experiences, and it is far from guesswork.

CULTIVATION OF MARINE AND FRESH-WATER ANIMALS IN JAPAN*

By K. MITSUKURI, PH. D.

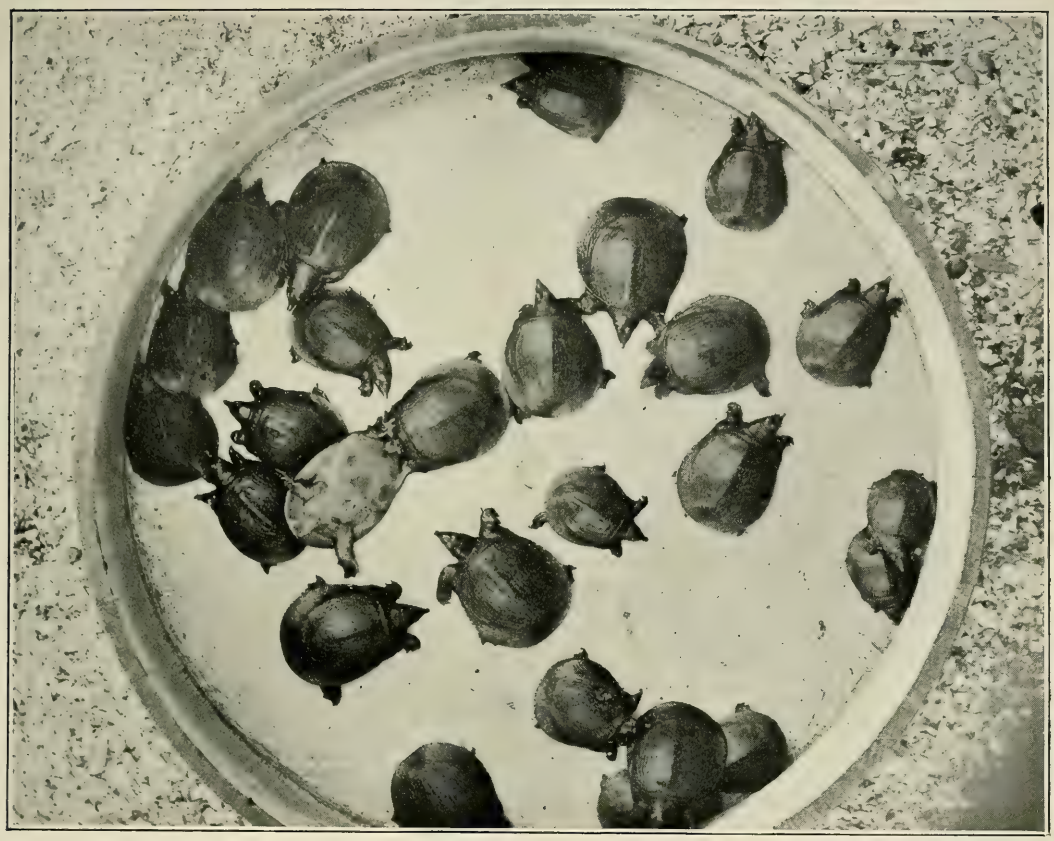
PROFESSOR OF ZOÖLOGY, IMPERIAL UNIVERSITY, TOKYO, JAPAN

WHILE the pasturage of cattle and the cultivation of plants marked very early steps in man's advancement toward civilization, the raising of aquatic animals and plants, on any extensive scale at all events, seems to belong to much later stages of human development. In fact, the cultivation of some marine animals has been rendered possible only by utilizing the most recent discoveries and methods of science. I believe, however, the time is now fast approaching when the increase of population on the earth, and the question of food supply which must arise as a necessary consequence, will compel us to pay most serious attention to the utilization for this purpose of what has been termed the "watery waste."

For man to overfish and then to wait for the bounty of nature to replenish, or, failing that, to seek new fishing grounds, is, it seems to me, an act to be put in the same category with the doings of nomadic peoples wandering from place to place in search of pastures. Hereafter, streams, rivers, lakes, and seas will have, so to speak, to be pushed to a more efficient degree of cultivation and made to yield their utmost for us. It is perhaps superfluous for me to state this before an audience in America, for I think all candid persons will admit that the United States, with her Bureau of Fisheries, is leading other nations in bold scientific attempts in this direction.

Japan, I need hardly remind you, consists of an immense number of islands, large and small. In proportion to its area, which is nearly 160,000 square miles, its coast line is immense, being, roughly speaking, 20,000 miles. This is broken up into bays, estuaries, inlets, and straits of all sorts and shapes, with an unusually rich fauna of marine organisms everywhere. In addition, the country is dotted with lakes and smaller bodies of fresh water. Put these natural conditions together with the facts that the population, in some districts at least, has been extremely dense, and that until within comparatively recent times hardly any animal flesh was taken as food, and even at the present day the principal food of the general mass of people consists of vegetables and fish—it would be strange indeed if the cultivation of some aquatic organisms had not developed under these circumstances. And such is actually the case. For instance, the oyster culture of

* This article is abstracted from a paper read before the International Congress of Arts and Sciences, held at the Louisiana Purchase Exposition, St Louis, Mo., August 21-25, 1904, and published by the U. S. Bureau of Fisheries as a special monograph, 1906.



From U. S. Bureau of Fisheries

Second-year Young of Snapping Turtle (Trionyx). Reduced $\frac{1}{35}$

Hiroshima and the algæ culture of Tokyo Bay are well-known industries which have been carried on for hundreds of years.

TERRAPIN FARMS

The place occupied among gastronomical delicacies by the diamond-back terrapin in America and by the green turtle in England is taken by the "suppon," or the snapping turtle, in Japan. The three are equally esteemed and equally high priced, but the Japanese epicure has this advantage over his brothers of other lands—he has no longer any fear of having the supply of the luscious reptile exhausted. This desirable condition is owing to the successful efforts of a Mr Hattori, who has spared no pains to bring his turtle farms to a high pitch of perfection, and is able to turn out tens of thousands of these reptiles every year. His are, so far as I am aware, the only turtle farms in the world which are highly successful.

In general appearance a turtle farm is at a first glance nothing but a number of rectangular ponds, large and small, the large ones having a size of 15,000 to 20,000 square feet. One or more of the ponds is always reserved for large breeding individuals, or "parents," as they are called.

In Hattori's farm a person goes around the "parents' pond" once a day or so and covers up with wire baskets all the new

Egg Deposits of Snapping Turtle (Trionyx) Covered with Wire Baskets

The eggs are generally spherical in shape, although sometimes more or less oblate. Their diameter is in the neighborhood of 20 millimeters, the largest being as large as 24 millimeters, the others smaller according to the size of the females. The number of eggs in one deposit varies from 17 or 18 up to 28 or more. Each female lays 2 to 4 deposits each season.

deposits made since the last visit. Each basket may be marked with the date if necessary. This covering serves a two-fold purpose—the obvious one of marking the place, and in addition that of keeping other females from digging in the same spot. When hundreds, or even thousands, of these baskets are seen along the bank of a "parents' pond," it is a sight to gladden the heart of an embryologist, to say nothing of that of the proprietor.

The hatching of the egg takes, on an average, sixty days. The time may be considerably shortened or lengthened, according to whether the summer is hot and the sun pours down its strong rays day after day, or whether there is much rain and the heat not great. It may become less than forty days or more than eighty days.

The young just hatched are put in a pond or ponds by themselves and given finely chopped meat of a fish like the pilchard. This is continued through September. In October the snapping turtle ceases to take food, and finally burrows into the muddy bottom of the pond to hibernate, coming out only in April or May.

From the third to the fifth year, inclusive, the young need not be kept in ponds strictly according to age, but may be more or less mixed, if necessary. The

young of these years are also the best and most delicate for eating and are the ones most sold in the market. In the sixth year they reach maturity and may begin to deposit eggs, although not fully vigorous till two or three years later. How old these snapping turtles live to be is not known. Those one foot and more in length of carapace must be many years old.

"breeding to a point" to perfection, and I have often been interested in hearing some of them talk in a way which reminded me of passages in the "Origin of the Species" or other Darwinian writings. This must be considered remarkable, for these breeders are, as a general thing, without much education, and have obtained all their knowledge from the practical handling of the fish.

The Demé-ranchu

EXTRAORDINARY GOLD-FISH

The gold-fish is the characteristically oriental domesticated fish. Its beautiful bright coloration and graceful form, with long, flowing fins, appeal most strongly to one's sense of the beautiful. It also is intensely interesting from the scientific standpoint, and proves a source of endless surprises to the biologist, for it is a plastic material with which skillful breeding can, within certain limits, do almost anything. Our gold-fish breeders seem to have understood the principle of

The history of the gold-fish is lost in obscurity. Like so many things in Japan, it seems to be an importation from China. There is a record that about four hundred years ago—that is, about the year 1500—some gold-fish were brought from China to Sakai, a town near Osaka. The breed then brought in is said to be that now known as the "wakin." There must also have been several later importations, and the Japanese must have improved vastly on the original forms, as in so many other cases of things introduced from foreign countries.

From U. S. Bureau of Fisheries

Varieties of Gold-fish (from Japanese Paintings)

Of all the extraordinary and odd-looking fishes, the demé-ranchu certainly is far in the lead in many respects, and is interesting as showing how far man can proceed in modifying nature. It is a telescope-fish with a short globular body, without the dorsal fin. The eyes have assumed a most extraordinary position. The ordinary telescope-fish is odd enough, with the eyes protruding, but in this variety dislocation has gone one step further. The eyes have not only started out of the head, but have turned upward 90 degrees, and have their pupils looking straight skyward. For this reason I should be inclined to call this "astronomical telescope-fish." As a fish, it is so monstrous that it gives one almost uncomfortable feelings.

All young gold-fish just hatched are dark in color, the bright colors coming only later. A great deal of experience and skill is needed in making the gold-fish change its color from black to red. If a person who is not an expert tries his hand at raising a lot of young gold-fish he will find to his sorrow that the fish remain black and do not assume bright colors, while those which may be from the very same lot of eggs, but have been under the care of a professional breeder, may have all donned the beautiful hues. The essential points to be attended to in bringing about this change seem to be (1) that the young fish should be given plenty of food; (2) that they should be exposed to the sun's rays and be kept as warm as possible, and (3) that the water of the pond in which the young are kept should be changed occasionally, although sudden transfer from warm to cold water in the middle of the day is to be avoided. The change of color begins in about sixty to eighty days from the time of hatching, and by the middle of August the fish should all have lost the dark pigment and acquired bright colors.

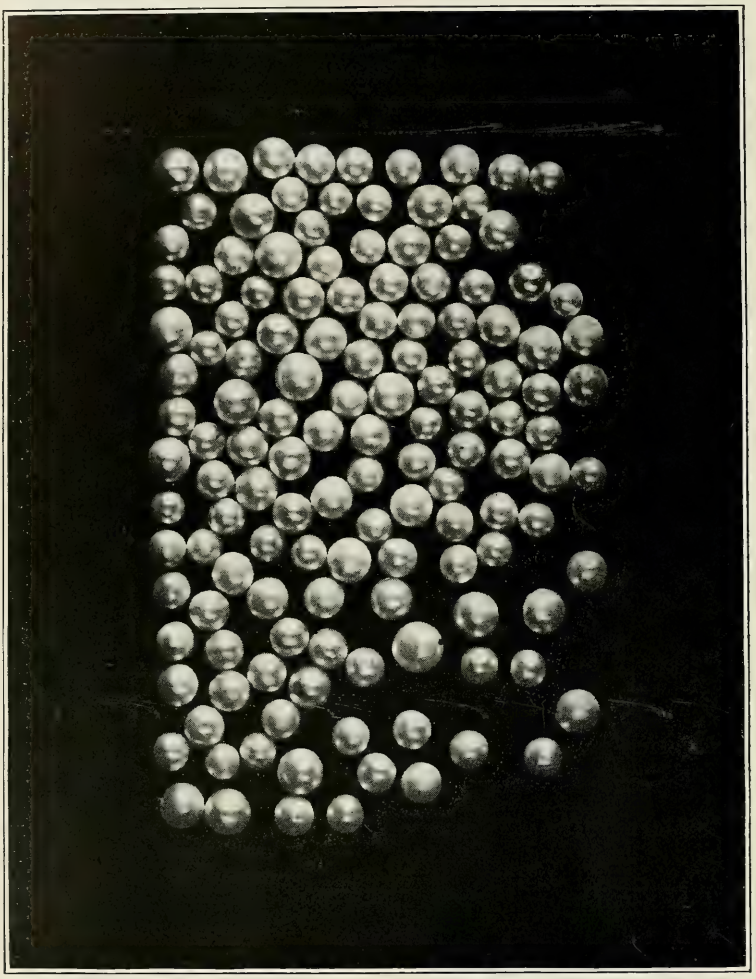
I have just now no available statistics in regard to the output of gold-fish, but the number produced must be millions upon millions. It shows the power of children in the nation, for they are par excellence the customers of these establishments. It is said that in the old regime, even in years when a famine was stalking in the land and hundreds were dying from starvation, there was a tolerable trade in gold-fish, proving the truth of an old proverb: "Crying children and landlords must not be disputed."

THE PEARL OYSTER

Various kinds of pearl oysters are found in the southern semi-tropical islands of Japan, but the only one which is at all common in Japan proper is the species *Avicula martensii* Dunker. This pearl oyster is found more or less along the whole of the coast of Japan, but there are some localities famous for producing it in quantities. Such are Shima, Omura (province Hizen in Kiushiu), Noto, Tosa, etc., and some fine pearls have been obtained from these places.

In 1890 I suggested to a Mr Mikimoto, a native of Shima, who had grown up and lived in the midst of the pearl-producing district, the desirability of cultivating the pearl oyster, and I pointed out to him also the possibility of making the pearl oyster produce pearls by giving artificial stimuli. He at once proceeded to experiment on it. The results have been beyond expectations, and today the Mikimoto pearl-oyster farm, put on a commercial basis, has millions of pearl oysters living on its culture grounds, and is able to place annually a large crop of pearls on the market.

The pearl oyster farm is in the Bay of Ago, on the Pacific side of central Japan, a few miles south of the famous Temple of Ise. The bay, like all in which the pearl oyster grows in abundance, is a very quiet piece of water with a most irregular, highly broken-up coast line full of deep-running inlets, coves, etc., with a depth of 3 to 7 fathoms, and affording most favorable shelter. Somewhat out of the center of the bay to the north there is a little island called Tadoko, where the land part of the enterprise, necessary buildings, etc., are placed, and where



From U. S. Bureau of Fisheries

Culture Pearls, Natural Size

altogether about 100 persons connected in some way with pearl-oyster culture are now living. Around and in the neighborhood of this island a large area of sea bottom, which with several large recent additions now amounts to 1,000 acres, has been leased by Mr Mikimoto.

The breeding season of the pearl oyster is July to August, and before this comes round—namely, in May to June—stones 6 to 8 pounds in weight are placed over the bottom of the spat-collecting grounds, which are generally in shallower parts, penetrating deep into land. By August tiny shells not more than 3 to 4 millimeters long are first discovered, attached to these stones by their byssus, and the number increases steadily with the season. An immense number of shells is collected every year. They are allowed to lie as they are until November, and then those that are too near the shore are removed with the stones on which they are anchored into depths greater than 5 or

6 feet. This is necessary to protect them from cold, from the effects of which they are apt to die in the course of winter if left in the original places. The young shells are then left quietly and allowed to grow for three years, or, better, some may be removed to deeper waters and where they are given more space and get more food, and grow better. At the end of three years, when they are about 5 to 6 cm. across, they are taken out of the water and the operations necessary for inducing them to produce pearls—that is, of putting in nuclei for pearls—are performed on them. At present the number thus operated on in a year is only 250,000 to 300,000. They are then put back in the sea and spread out at the rate of about 30 to every tsubo (6 feet square), and are left alone for four years more. At the end of that time, or seven years and a half from the beginning, they are taken out of the water and opened. Natural pearls, as well as "culture pearls," as I have named those produced from the introduced nuclei, are thus harvested and put on the market.

As in all culture enterprises, there are many enemies of the pearl oyster, as well as unexpected difficulties in the way of its culture. *Octopus, Codium, Clione* (sponges), all sometimes play a sad havoc among the mollusks, but the most dreaded enemy of all is the "red current" or "red tide." This is an immense accumulation of a Dinoflagellata, *Gonyaulax,* causing discoloration of the sea water, and, in some way not well accounted for, causing in its wake an immense destruction of marine organisms, large and small.

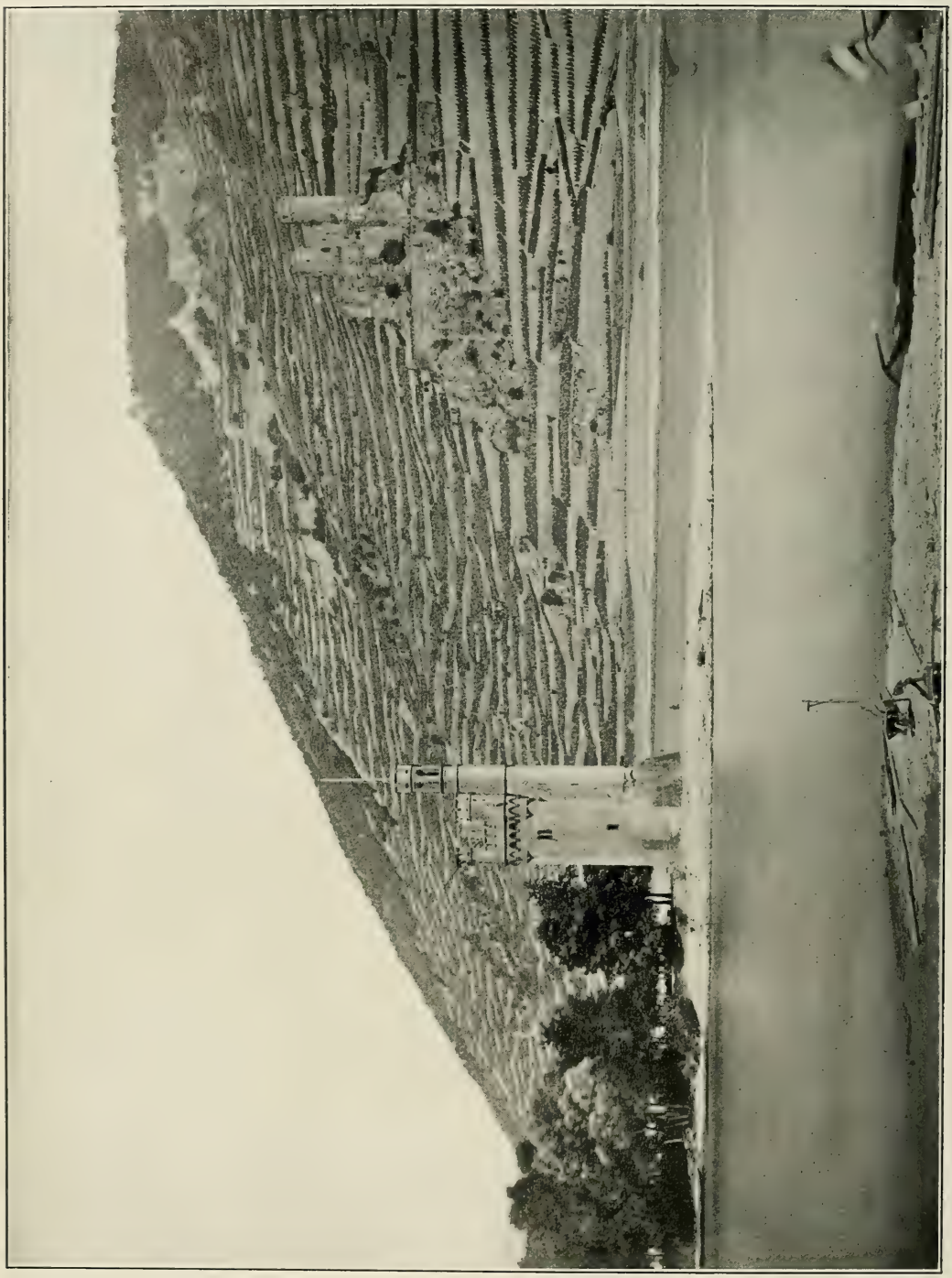
The "culture pearls" are, I regret to say, either half pearls or only a little more than half pearls, but as regards luster, shape, and size, they are beautiful beyond expectations, and meet the requirements completely in cases where only half pearls are needed.

Pearl-oyster culture is still in its infancy, but its promises are bright. If, in addition to half pearls, full or "free" pearls can be produced at will, as there are some hopes, it will be a great triumph for applied zoölogy.

THE LUMBER BUSINESS OF THE GOVERNMENT

A NATURAL feeling among lumbermen toward the forest work of the government is that the government is not in the lumber business and can not, therefore, take the lumberman's business point of view. Yet a greater misconception could scarcely exist. As a dealer in stumpage, the government is the largest lumber dealer in the country. Further, it applies to its sales the practice of scientific forestry, requiring the removal of the timber under the same sort of instructions which it advises for private operators. Thus the Forest Service, in its reserve work, is giving an object lesson on a huge scale to enforce its teachings that conservative management and profit may go hand in hand. In the year 1905 the total sales reached a value of $273,659.82.

The restrictions governing the timber sales, while effective, are simple. Application is made to the local officer in charge of the reserve from which the timber is desired, who executes small sales on the ground. In case of large sales, the application is forwarded to the Forest Service, from which the advertisement of the sale is made. Applicants for timber are required to send sealed bids to the Forest Service. Small bidders enjoy exactly equal opportunities with large, and monopolization is effectually forestalled. The highest bid fixes the price. Should the first applicant desire to begin cutting immediately he may (except in California) do so, on condition that he pay in advance at a price already fixed by the Forest Service, and that he obligate himself to pay the full amount named in the highest bid. Thus delay is avoided and the government is



Terraces of Vineyards on the Rhine, near Bingen

protected. Speculation in reserve timber is made impossible by the provision that the timber must be removed within a specified time, and that when a contract extends over several years a proportionate amount of timber must be removed each year. Five years is the extreme limit of a sales contract.

That these restrictions are not onerous is shown by the numerous sales made under them. A single sale of 50,000,000 feet of lodgepole pine for railroad ties is pending on the Montana Division of the Yellowstone Forest Reserve. It is estimated that 165,000,000 feet B. M. of lodgepole pine can be taken from one watershed in the Medicine Bow Forest Reserve, still leaving a large percentage for future crops. Much timber is sold in small lots; fifty applications for such sales are made to each single application for 1,000,000 board feet or more; the prompt, businesslike consideration accorded such applications standing in marked contrast with the slow methods once prevailing, when all applications had to be made through Washington.

FORESTS AS REVENUE

During the year 1905 the sales of timber from the national reserves were as follows:

The largest sales so far made are 71,466,537 board feet from South Dakota, 68,255,916 from Wyoming, and 5,327,443 from Utah.

In sales of wood for fuel South Dakota led with 29,844½ cords, Arizona followed with 16,649, and Colorado with 10,795½. The total number of cords sold was 74,120.

In sales of posts and poles Montana led with 119,500, followed by Wyoming with 30,750, and Colorado with 13,988. The total number sold was 188,740.

The largest timber sales were made in Wyoming, where they reached $143,894.81. South Dakota's sales ranked second in value, amounting to $78,958.24, and Colorado's to $23,937.07. The total sales for 1905 reached $273,659.82.

Nor are the receipts from these sales swallowed up by the cost of administration. The entire property of the forest reserves, worth $250,000,000 in cash, is now being administered at a cost of less than one-third of 1 per cent of its value, while increase in that value of not less than 10 per cent a year is taking place. As the use of the reserves increases, the cost of administration must, of course, increase also, but receipts will certainly increase much more rapidly. The time is not far distant when the forest reserves will become self-sustaining. Later they may confidently be expected to become a source of public revenue.

A POLAR MAP

AMONG the features of early numbers of the NATIONAL GEOGRAPHIC MAGAZINE are a six-colored map of the regions around the North Pole, 30 x 36 inches, and an illustrated résumé of the United States Eclipse Expedition of 1905, by Rear Admiral Colby M. Chester, U. S. N., with a picture of the corona in four colors.

GEOGRAPHIC LITERATURE

Elements of Geology. By Prof. William Harmon Norton. Pp. 461. Many illustrations and maps. 5½ by 8 inches. New York: Ginn & Co. 1905.

Professor Norton has summarized in a compact form the principal facts of geology. The book is well illustrated and the style comparatively simple, so that the volume will prove eminently useful to those who want a condensed work on geological science.

Italy. By W. Deecke. Translated by H. A. Nesbitt. Pp. 485. Illustrated. 10 by 7 inches. New York: MacMillan Co. 1905.

Professor Deecke gives us a studious account of the country, people, and institutions of Italy, including Malta and Sardinia. The translator has done his work well and the book can be recommended to those who are seeking a comprehensive description of the Italian Peninsula.

The Philippine Islands, 1493-1898. Vols. XXII (1625-1629), pp. 323; XXIII (1629-1630), pp. 299. Illustrated. Cleveland: Arthur H. Clark Co. 1905.

Volume XXII of this valuable publication has special interest from its accounts of social life at Manila, the fostering of educational interests, and the regulation of the Chinese. XXIII contains very extended extracts from Fr. Medina's entertaining and valuable history of the Augustinians in the Philippines.

A. W. G.

Modern India. By William Eleroy Curtis. Illustrated. 513 pages. Fleming H. Revell & Co. 1905.

This is a republication of a series of letters written during the winter of 1903-1904. The author is an experienced traveler who has retained youthful eyes. Wherever he goes, he sees many things overlooked by others, especially by the chronic globe-trotter, and he has a delightful way of serving it up. He tells what one wants to know, and he tells it in a simple but most interesting way.

His journeyings in India commenced in Bombay and ended in Calcutta. The straight trip across was varied by side trips to certain places, as Delhi, Simla, etc., and his itinerary and descriptions of places are varied by bits of history, accounts of Indian institutions and social customs. For an understanding of the surface features of this East Indian people, this book is admirable. H. G.

Problems of the Panama Canal. By Brig. Gen. Henry L. Abbot. Pp. 247. 5½ x 8 inches. New York: The Macmillan Co. 1905.

An excellent history of the French work on the Isthmus, including much useful information on the climatology, the Chagres floods, and the physical geography of the Isthmus.

American Park Systems, by Andrew Wright Crawford, contains an account of the park system of every city in the United States which has begun making parks. The work done is illustrated by a map of each city The little book, which has a patriotic as well as commercial value, can be obtained of the author, 701 Stephen Girard Building, Philadelphia.

Rhode Island. A Study in Separatism. By Irving Berdine Richman. Pp. 495.

Louisiana. A Record in Expansion. By Albert Phelps. Pp. 412.

American Commonwealths. Boston and New York: Houghton, Mifflin & Co. $1.10 net.

Each of the above books gives a good history of the state chosen, but both are inadequate in that they summarize in a few words the last 30 years, and contain practically nothing about the states as they are today.

GOOD BOOKS ON THE WEST INDIES

"Cuba and Porto Rico," with the other islands of the West Indies; their topography, climate, flora, products, industries, cities, people, political condition, etc. Robert T. Hill. Century Co. Illustrated and indexed. $3.00.

"Report on the Census of Cuba, 1899." Lt. Col. Joseph P. Sanger, director, War Department. Government Printing Office. Illustrated. (Out of print.)

"Report on the Census of Porto Rico, 1899." Lt. Col. Joseph P. Sanger, director, War Department. Government Printing Office. Illustrated. (Out of print.)

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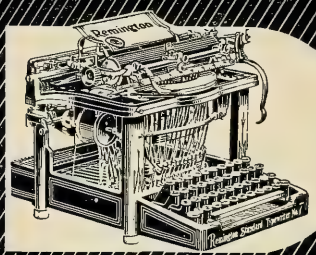

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CUBA

The Pearl of the Antilles

MAP OF CUBA, 12x24 Inches

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THE NATIONAL GEOGRAPHIC MAGAZINE

CUBA—THE PEARL OF THE ANTILLES*

THE island of Cuba is especially favored by nature in point of both geographical position and material resources. It lies at the gateway of the Gulf of Mexico, midway between the United States on the north and Mexico and South America on the south, and is the largest and by far the richest in natural resources of all the scores of islands and islets on the north, east, and south, and forming collectively what is generally termed the West Indies.

Cuba is entirely within the Torrid Zone, but not so far south as to make its climate characteristically torrid. The temperature does not differ materially from that of our own Gulf states, though the rainfall is greater. Its insularity insures a moist, equable atmosphere, as in the case of Great Britain, and the sea breezes of the afternoons and evenings tend to make the nights cool and comfortable, even in the warmest months. The outlying Bahaman chain of islands and banks shelters it in a great measure from the cold Atlantic gales of winter, and about its only climatic disadvantage consists in its exposure to the occasional Caribbean hurricanes.

The island is long and narrow and its longitudinal trend is nearly easterly and westerly. It is 730 miles long and its width varies from about 25 miles to about 100 miles. Its area comprises about 44,000 square miles. In respect to these features and dimensions, as well as in some other respects, there is a striking similarity between Cuba and Java, in the East Indies. In area it is about as large as Pennsylvania or Louisiana. The coast lines are exceedingly jagged and irregular, and the coasts themselves are generally either rocky or marshy and in many places menaced by outlying reefs and sand banks, notwithstanding which there are a number of safe and commodious harbors, notably those of Habana, Matanzas, Cardenas, Nuevitas, Cienfuegos, Manzanillo, Santiago de Cuba, and Guantanamo. The harbor of Habana, as is well known, is one of the largest and finest in the world. The Cienfuegos harbor is also a very fine one.

Measuring from the points of nearest approach to its neighbors, Cuba is about 100 miles from Key West, Florida; 54 miles from Haiti, 85 miles from Jamaica, and about 130 miles from Yucatan, on the

* This article is derived from the following authorities, all of which are particularly recommended to those desiring further information on the subject:

"Commercial Cuba in 1905." by O. P. Austin, published by Bureau of Statistics, Department of Commerce and Labor; "Handbook of Cuba," by Senor Gonzalo de Quesada, Minister of Cuba to the United States, published by the Bureau of American Republics, 1905; "Census of Cuba, 1899," by Gen. J. P. Sanger, Henry Gannett, and W. F. Willcox, published by the War Department; "Commercial Cuba," by Edwin V. Morgan, U. S. Minister to Habana, Consular Reports No. 2629, August 1, 1906; "Trade Conditions in Cuba," by Charles M. Pepper, published by the Department of Commerce and Labor, 1906.

north, east, south, and west respectively. Habana is distant from Tampa, Florida, 306 miles; from New Orleans, 597 miles; from New York City, 1,227 miles; from Plymouth, England, 3,527 miles, and from Gibraltar, 4,323 miles.

The island is divided into six provinces, each extending entirely across the width of the island. Beginning at the west and proceeding in order toward the east, these provinces are named as follows: Pinar del Rio, Habana, Matanzas, Santa Clara, Camaguey (known as Puerto Principe until recently changed by vote of the people), and Oriente (formerly known as Santiago de Cuba). The "backbone" of the island consists of a range of hills or mountains, attaining an elevation of 2,500 feet in Pinar del Rio, and 5,000 feet, with an extreme instance of about 8,300 feet, in Oriente, but much lower altitudes in the other four provinces. Except in Oriente, these hills or mountains are in no case formidable or unavailable for cultivation, and the greater part of the island consists of broad, rolling plains or gently undulating hills, interspersed with stream-drained valleys, and already proved to be susceptible of a high degree of cultivation.

The soil in the main, and except in the most marshy and most mountainous regions, is rich and easily cultivable. It is principally of the best varieties of the Tertiary and Secondary geological formations and adapted to the production of bountiful crops of many valuable staples. Certain sections of the land that are not particularly suitable for arable purposes are nevertheless admirably adapted for grazing uses, and the more elevated tracts, if in some localities unfitted for either cultivation or grazing, are still rich in mineral wealth, so that it may be said with truth that practically the whole island is overflowing with natural riches.

Furthermore, most of the higher lands are covered with a virgin forest containing immense quantities of valuable timber. The list of the native flora of the island includes more than 3,350 plants, including many of the best and most useful species of wood known to mankind. Game is abundant, such as deer, rabbits, wild boars, wild turkeys, pheasants, snipe, etc., and there are more than 200 species of native birds, many of them wearing gorgeous plumage. As usual in tropical countries, there are some unwelcome inhabitants, such as crocodiles, snakes, tarantulas, scorpions, and various annoying insects, but none of the snakes are venomous and there are no dangerous wild beasts.

The rivers are short, small, and mainly unnavigable, but they are quite numerous and all-sufficient for the purposes of drainage and irrigation, and in some cases for water power.

So richly endowed with natural advantages, Cuba, not without reason, has been entitled the "Pearl of the Antilles" and the "Gem of the Seas."

The original Indian native race of Cuba has entirely disappeared. The exact number of inhabitants at the time of the appropriation of the island by Spain is of course not known, even approximately; they may have numbered several hundred thousand; but they met the usual fate of the weaker race in the onward march of the stronger.

In the course of a century or thereabout the place of the natives had been filled by imported negro slaves. The present colored inhabitants of Cuba are, in general, the descendants of these slaves. They are now free, slavery having been abolished in 1880.

The white Cubans, or Cubans proper, are mainly the descendants of the original Spanish settlers from Spain, Haiti, Florida, and Louisiana, and of the French settlers who fled to Cuba from Haiti during the race wars in that island a century ago. The Spanish Cubans remained devotedly loyal to Spain during many decades of oppressive misrule, enduring all their injuries and sacrifices with a noble patience which has become proverbial and which won for Cuba the sobriquet of "the ever-faithful isle." At last the time came when even this patience was exhausted, and the isle was lost to Spain.

PRESENT POPULATION ABOUT 1,700,000

The population of Cuba, according to the census taken under the direction of the United States War Department in 1899, was 1,572,797. Twelve years earlier, in 1887, according to a census under Spanish authority, the number was 1,631,687, or nearly 59,000 greater. After allowing for the probable increase of the population between 1887 and 1895, the date on which the insurrection broke out, the loss of life, as indicated by these two censuses, may be estimated at nearly 200,000, a loss which may be attributed to the war and to the accompanying reconcentration. The loss of population incident to the insurrection was sustained entirely by the three western provinces, the three eastern provinces having gained during the period between 1887 and 1899, although Santa Clara, one of the largest provinces of the island, gained but a trifling amount.

In 1903 the population was estimated at 1,653,486, and taking into consideration the natural increase and the number of immigrants which have settled in Cuba, it may be safely said that the population reaches, in 1906, 1,700,000 souls, and that Habana has more than 275,000 The center of population of Cuba in 1899 was situated in Santa Clara Province, 30 miles southwest of the city of Santa Clara and 8 miles northwest of Cienfuegos. It is at a distance of 75 miles northwest of the geographic center of the island.

The urban population of Cuba, including in that term the inhabitants of all cities of more than 8,000 population, was 32.3 per cent of the entire population, or a little less than one-third, being but a trifle smaller than that of the United States. Including, however, all cities down to 1,000 each, the proportion of urban population rises to 47.1 per cent, that of the United States being the same. The capital and chief city of the island is Habana, situated on the north coast near its western end. Other important cities are Santiago, the capital of Oriente Province, on the south coast, near the eastern end of the island, population 43,090; Matanzas, the capital of Matanzas Province, on the north coast, population 36,374; Cienfuegos, in Santa Clara Province, on the south coast, population 30,038; Camaguey, the capital of the province of the same name, situated in the interior, population 25,102; Cardenas, on the north coast, in Matanzas Province, population 21,940. Most of the larger cities are situated on the seacoast rather than in the interior, indicating their commercial character.

In former times the Cuban cities were unhealthful, owing to insanitary conditions, and yellow fever was prevalent; but by the adoption of energetic and scientific measures during and since the recent United States occupation, these conditions have been materially improved and the fever has almost disappeared. The health status of the island is now quite satisfactory. The mortality in the island during 1902 was 25,512, and in 1903, 23,982, and the annual death rate diminished from 15.43 in 1902 to 14.52 in 1903. If a comparison is made with the lowest rate in the Spanish regime, 29.30 per thousand in 1885, and with the average rate for the thirty years ending 1900, of 41.95 per thousand, the wonderful progress made can be seen.

The figures as to the density of population are significant. They indicate a population of 153 persons to the square mile in the Province of Habana, 55 in Matanzas, 37 in Santa Clara, 35 in Pinar del Rio, 26 in Oriente, and only 8 in Camaguey. In other words, Havana Province is as thickly inhabited as New York State and Camaguey about as much so as Washington State. The density of population throughout the two republics is nearly equal, that of Cuba being somewhat greater than that of the United States. A relatively larger area remains uncultivated or unsettled in Cuba, and practically all the unsettled area in the island is available for high cultivation, whereas vast expanses of territory in the United States are unavailable for this

purpose on account of aridity or inaccessibility. It has been estimated that Cuba is capable of supporting in comfort and prosperity a population of at least 15,000,000. That would be 340 to the square mile, which is less than the density of population in Rhode Island or Massachusetts, where life is on a very comfortable and civilized plan, and much less than the density in most tropical countries. Allusion has been made to Java as affording many points of resemblance to Cuba. In respect to population it affords at least one point of decided difference. The area of Java is about 49,000 square miles; that of Cuba about 44,000. The population of Java is about 28,000,000; that of Cuba about 1,630,000. The density of population of Cuba is about 36 to the square mile; that of Java is about 570 to the square mile.

ABOUT ONE-THIRD OF POPULATION ARE COLORED

As to sex, the population was distributed in the proportions of 51.8 per cent males and 48.2 per cent females, the excess in number of males being probably due to immigration.

As to race, there were 58 per cent native white, 9 per cent foreign white, and 32 per cent colored. The colored formed less than one-third of the population, and their proportion has for many years been diminishing. Three-fourths of all the foreign-born in Cuba came from Spain. Of the remainder, the countries which most frequently contributed were China, Africa, and the United States.

The illiteracy of the population, though deplorable, is not surprising in consideration of the history of the island. According to the census of 1899, the proportion of illiteracy (inability to read or write any language) among the white native citizens was 51 per cent and among the colored citizens 74 per cent. The later reports from the island, however, contributed by Gen. Leonard Wood in 1902, and since then by the Cuban authorities, show a great and constant improvement in this important respect. The Cubans are very intelligent and quick to learn, and are now also ambitious to learn, and the stigma of illiteracy will not much longer deface the island in a noticeable degree.

The census of 1899 reports nearly 40 per cent of the Cuban population as engaged in gainful occupations, as against about 38 per cent in the United States by the census of 1900. This, it must be conceded, is a praiseworthy showing on the part of the Cubans. Of their 640,000 or so of bread-winners, about 48 per cent are classified as engaged in agriculture, fisheries, and mining; about 23 per cent in domestic and personal service; about 15 per cent in manufacturing and mechanical pursuits; about 13 per cent in trade and transportation, and about 1 per cent in professional service. These were the percentages of 1899, and it is understood that about the same proportions are observable now, although the professional class is apparently increasing its percentage of late and the manufacturing and transportation interests are undoubtedly drawing recruits from the purely agricultural ranks.

RESULTS OF UNITED STATES OCCUPATION

The occupation of the island by the United States authorities, or "intervention," as it is termed in Cuba, lasted for about three years and a half—from January 1, 1899, to May 20, 1902. The intervention was undertaken solely in order to protect the Cubans from molestation from outside while they were recovering from the wounds and ravages of war, and to assist them in putting their new house in order. As soon as this was accomplished and a "stable government" established in the new republic, the intervention was withdrawn.

The closing paragraphs of Gen. Leonard Wood's final report of 1902 contain an effective summary of the principal services rendered to the people of Cuba by the United States temporary government in the island, as follows:

"The government was transferred as a 'going concern;' all the public offices

were filled with competent, well-trained employees; the island was free from debt, other than such obligations as were of a current character, and had a surplus of over a million and a half dollars available for allotment; was possessed of a thoroughly trained and efficient personnel in all departments and completely equipped buildings for the transaction of public business; the administration of justice was free; *habeas corpus* had been put in force; old prison abuses had been stopped; police courts had been established; a new marriage law on lines proposed by the Roman Catholic bishop of Havana, giving equal rights to all denominations, was in operation; a general electoral law embodying the most enlightened principles of modern electoral laws had been put in force, and the people were governed in all municipalities throughout the island by officials of their own choice elected under this law; trials in Cuban courts were as prompt as in any state in the Union, and life and property were absolutely safe; sanitary conditions were better than those existing in most parts of the United States; yellow fever had been eradicated from the island; a modern system of public education, including a reorganized university, high schools, and nearly 3,700 public schools, and laws for its government, was in successful operation; well-organized departments of charities and public works operating under laws framed by the military government had been established; a new railroad law had been promulgated; the customs service had been thoroughly equipped; the great question of church property had been settled; a basis of settlement between mortgage creditors and debtors had been agreed upon and in successful operation for a year; municipalities had been reduced from 138 to 82 in number; public order was excellent; the island possessed a highly organized and efficient rural guard; an enormous amount of public works had been undertaken and completed; ports and harbors had been much improved; old lighthouses had been thoroughly renovated and new ones built; Cubans and Spaniards were living in harmony; in short, the government as transferred was in excellent running order; the people were making rapid progress; beggars were practically unknown; the courts had the confidence and respect of the people. * * *

"The work called for and accomplished was the building up of a republic by Anglo-Saxons in a Latin country where approximately 70 per cent of the people were illiterate; where they had lived always as a military colony; where general elections, as we understand them, were unknown; in fact, it was a work which called for practically a rewriting of the administrative law of the land, including the law of charities and hospitals, public works, sanitary law, school law, railway law, etc.; meeting and controlling the worst possible sanitary conditions; putting the people to school; writing an electoral law and training the people in the use of it; establishing an entirely new system of accounting and auditing; the election and assembling of representatives of the people to draw up and adopt a constitution for the proposed new republic; in short, the establishment in a little over three years, in a Latin military colony in one of the most unhealthy countries in the world, of a republic modeled closely upon lines of our great republic, and the transfer to the Cuban people of the republic so established, free from debt, healthy, orderly, well equipped, and with a good balance in the treasury. All of this work was accomplished without serious friction. The island of Cuba was transferred to its people as promised, and was started on its career in excellent condition and under favorable circumstances."

THE LABOR QUESTION

Cuba is entirely dependent upon the products of her fields for her economic prosperity. She does not carry and exchange merchandise for other countries, nor does she manufacture except to supply certain special and local demands or

to place her crops most easily and economically upon the market. These conditions determine the character of her industrial life. Her highly skilled workmen have mostly come from beyond the seas. The labor question has not assumed a social aspect. It has simply been a problem of supply and demand of field hands. There is little special skill, little organization, little class spirit among her working people. A tinge of paternalism, prolonged in Cuba by the late continuance of slavery and the Spanish tendency to organize commercial enterprises upon a domestic basis, pervades the relations of employer and employee. Even in urban centers the industrial characteristics of an agricultural community prevail.

The real labor supply of Cuba is inadequate to the needs of the island. It does not permit the exploitation of resources already in sight, much less does it afford a social motive for developing new industries. The intelligent people of the island appreciate this condition. They have tried to remedy it by encouraging the importation of labor from abroad. Now that their national aspirations appear to be realized, they desire that this labor shall be composed, so far as possible, of permanent settlers, who will become identified with Cuban sentiments and interests and raise the prevailing standard of intelligence and citizenship.

There is no trait more marked in the Cuban workman in every employment than his preference for contract or piece work over a regular wage. The former seems to appeal to a speculative tendency in his nature that adds interest to his occupation. It also flatters a certain sentiment of self-esteem. He feels himself more independent, more his own master in the former instance. Perhaps there is a prejudice against hired service that has come down from the days of slavery and contract labor. There are few workmen harder to drive and easier to lead than the Cubans. Whatever the reason, employers all emphasize the preference of the people for contract work.

THE COMMERCE OF CUBA

The foreign commerce of Cuba, according to the latest returns received by the Bureau of Statistics of the Department of Commerce and Labor, amounts to 200 million dollars per annum, the imports being 95 million dollars and the exports 110 millions.

There has been a steady gain in the share of the imports drawn from the United States, the share in 1894 being 39 per cent; in 1902, 42 per cent, and in 1906, 50 per cent. The share of the exports sent to the United States was, in 1894, 85 per cent; in 1902, 77 per cent, and in 1906, 87 per cent.

Of the exports, which are composed chiefly of sugar, tobacco, and fruits, nearly all of the sugar and a large proportion of the fruits are sent to the United States, and the exports of tobacco are divided between the United States and Europe.

Of the 48 million dollars' worth of imports from the United States, iron and steel manufactures amounted to practically 10 million dollars, meat and dairy products about 6 millions, flour a little over 3 millions, lumber 2½ millions, leather and its manufactures about 2 millions, cattle about 2 millions, coal a little less than 2 millions, coffee (from Porto Rico) about 1½ millions, cotton manufactures about 1½ millions, and vegetables about 1 million.

BRITISH AND AMERICAN INVESTMENTS IN CUBA

The British investment, estimating railroads at $90,000,000, shipping at $5,000,000, and real estate and industries at $5,000,000, may be approximated at $100,000,000, as against nearly $120,000,000 of American money in the island.

The oldest and most profitable railroads in Cuba are owned and operated by British capital, namely, the Western Railroad of Habana, the United Railways of Habana, and the Cuban Central Railroad, which are owned by one group, while the stocks of the United, Maria-

nao, Cardenas and Jucaro, and Matanzas railways are held by another group of London financiers. These lines form a network of communication through the west-central portion of the island, the great sugar and tobacco producing and the most fully developed and thickly populated part of Cuba, and serve Habana, Matanzas, Cardenas, Cienfuegos, Caibarien, Sagua, and Batabano. Sugar shipments constitute the bulk of the freight to the coast. Inward loads and passenger traffic are also dependent upon this staple, for the power of the rural population to purchase general merchandise and the ability of the country folk to travel over the lines is regulated by their sugar profits, direct or indirect.

The sugar crop of the four provinces traversed by these railroads has been estimated for 1906 at 7,746,800 bags. It is probably not unsafe to say that fully 80 per cent of the total, or 6,197,240 bags, were carried by the British railroad lines at an average rate of between 20 and 80 cents, or 50 cents a bag, giving an approximate annual earning of $3,098,620 from this source alone.

EXTENSION OF RAILWAY SYSTEMS

Habana, the principal port of the island, with a population of 275,000 and a total trade worth $105,025,676, of which $65,183,479 are imports and $39,842,197 exports, is served by both the Western and the United Railways. The former runs through a rich tobacco and pineapple country to Pinar del Rio. The Cuban Central connects Cienfuegos, whose imports and exports aggregate $19,367,000, with Sagua, with a like total of $6,611,000, and then with Caibarien, where foreign trade reaches $5,755,000. Other cities on the line are small in size, such as Santa Clara, Cruces, Camajuani, and Placetes. This district produces 38 per cent of the sugar output as well as a considerable tobacco crop.

The United Railways connect Habana with Matanzas, the foreign trade of which reaches $11,750,000, and also with the small cities of Batabano on the south coast, Guanajay, Guines, Regla, Jovellanos, and Guanabacoa. The company controls the Marianao suburban passenger line and the Cardenas and Jucaro Railway, the latter running through a cane and tobacco country, the principal port of which is Cardenas, where the imports and exports aggregate $12,241,459. It is stated that the United Railways interests have in addition purchased the Matanzas Railroad for $10,000,000. Matanzas is the only point at which it reaches the coast, but it connects with other roads and its inclusion in the system greatly strengthens the whole.

The Habana Electric and Habana Central are under aggressive American management, but their capitalization, including the investments represented by the Insular Railroad Company and the Cuba Electric Company, totaling $16,000,000, is to a considerable extent English and Canadian. The Habana Electric is the older company, while the Habana Central, having been organized for little over a year, is as yet in course of construction. It is hoped that when the latter is completed it will be able successfully to compete with the established roads which now handle the tobacco and sugar in Habana Province. A large proportion of the year's pineapple shipments has been made over the company's newly laid tracks, and the fruit farmers in the vicinity of Habana have been well satisfied with their treatment.

The Cuba Company, with an authorized capital of $20,000,000, is controlled by a Canadian president, Sir William Van Horne, although 80 per cent of the stock is supposed to be held in the United States. It runs from Santa Clara to Santiago, a port handling $10,771,000 in foreign trade.

The road has been hastily built, and the company, by the erection of sugar mills and special inducements to settlers, is endeavoring to develop the country in order to create its own traffic. An extension to Holguin, to connect with the Holguin and Gibara Railroad, reaching the coast at the latter place, is under construction,

and a branch has already been completed to Antilla, the port on Nipe Bay, which the company intends to make one of the most important shipping points in Cuba.

REVIEW OF AGRICULTURAL WEALTH

Cuba is essentially an agricultural country, and prior to the last war there were nearly a hundred thousand (90,960) plantations, farms, orchards, and cattle ranges, valued at 220,000,000 pesos ($200,000,000). Of manufactories there were practically none, if we except the cigar factories and the sugar mills producing raw sugar, molasses, and rum.

In early colonial days the principal industry was cattle raising, very little attention being paid to agriculture for two hundred and fifty years after the settlement of the island. The chief agricultural products of Cuba are sugar, tobacco, and fruit, and the cultivation of oranges for exportation has of late augmented. Very little more coffee is cultivated than is required for home consumption, although it was once a promising industry. The soil and climate of the eastern provinces are well adapted to the growth of the coffee berry, and it is said to equal in flavor the best coffee of the West India Islands. No doubt coffee culture will again be revived and extensively developed, and we may expect to see in Cuba a revival of the once famous "cafetales," or coffee plantations.

Fruits and vegetables of all kinds are being exported in large quantities, especially pineapples, cocoanuts, bananas, potatoes, tomatoes, etc. The Cuban potato, hitherto unknown to the world, has made its appearance in the United States markets during the last few years, and is already a dreaded rival of the once famous Bermuda tuber.

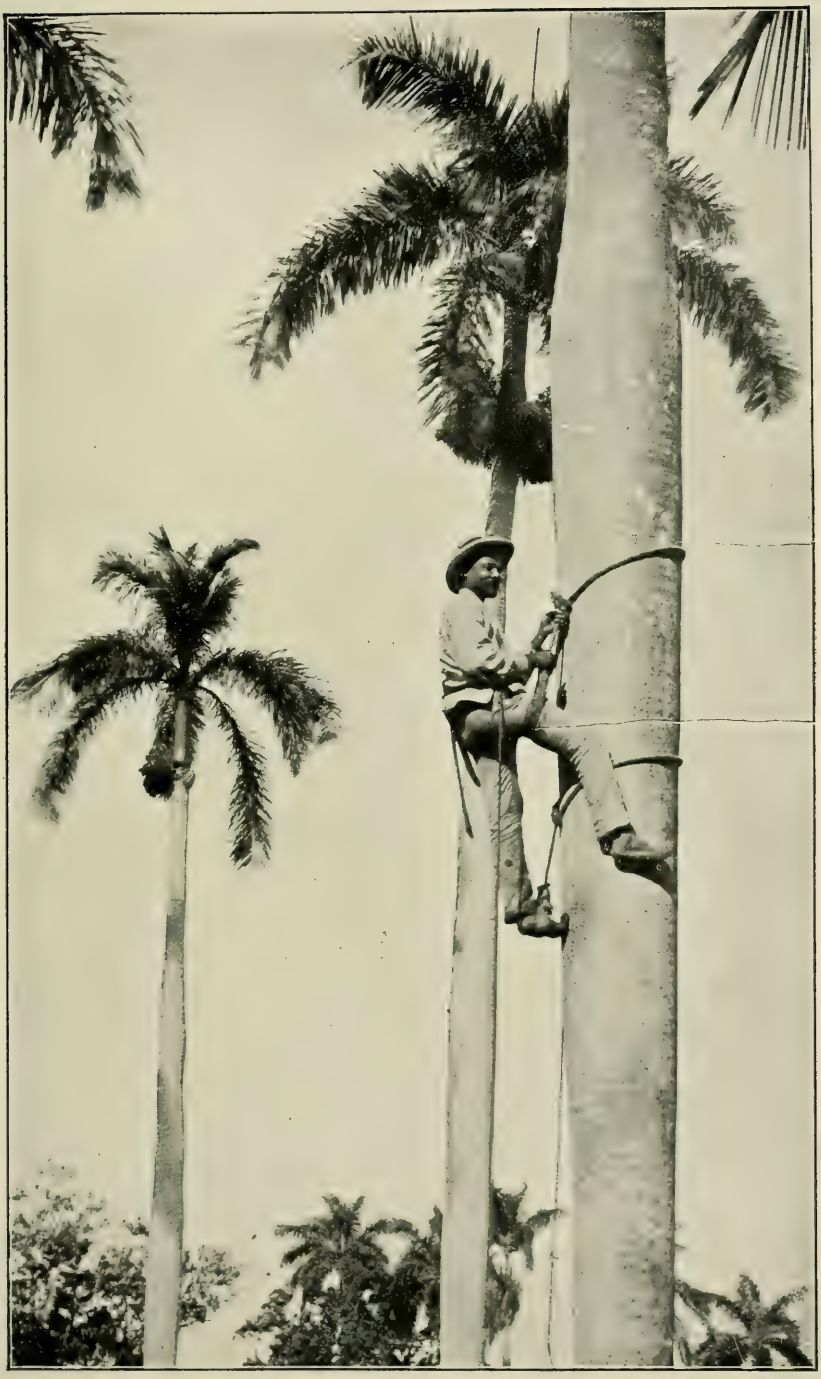
The fact that frost is unknown in Cuba, which greatly diminishes the dangers to crops, and the unquestionable excellence of the Cuban fruits and vegetables, are all-powerful factors, which will no doubt contribute toward the spreading of the Cuban fruit and vegetable trade.

THE PURPOSE OF THE PROVISIONAL GOVERNMENT AS DEFINED BY SECRETARY TAFT IN THE PROCLAMATION ESTABLISHING IT, SEPTEMBER, 1906

The provisional government hereby established will be maintained only long enough to restore order, peace, and public confidence, by direction of and in the name of the President of the United States, and then to hold such elections as may be necessary to determine on those persons upon whom the permanent government of the republic should be devolved. In so far as is consistent with the nature of a provisional government established under the authority of the United States, this will be a Cuban government, conforming with the constitution of Cuba. The Cuban flag will be hoisted as usual over the government buildings of the island; all the executive departments and provincial and municipal governments, including that of the city of Havana, will continue to be administered as under the Cuban republic; the courts will continue to administer justice, and all the laws not in their nature inapplicable by reason of the temporary and emergent character of the government will be in force.

ADDRESS OF SECRETARY TAFT AT THE OPENING OF THE UNIVERSITY OF HABANA, OCTOBER 2

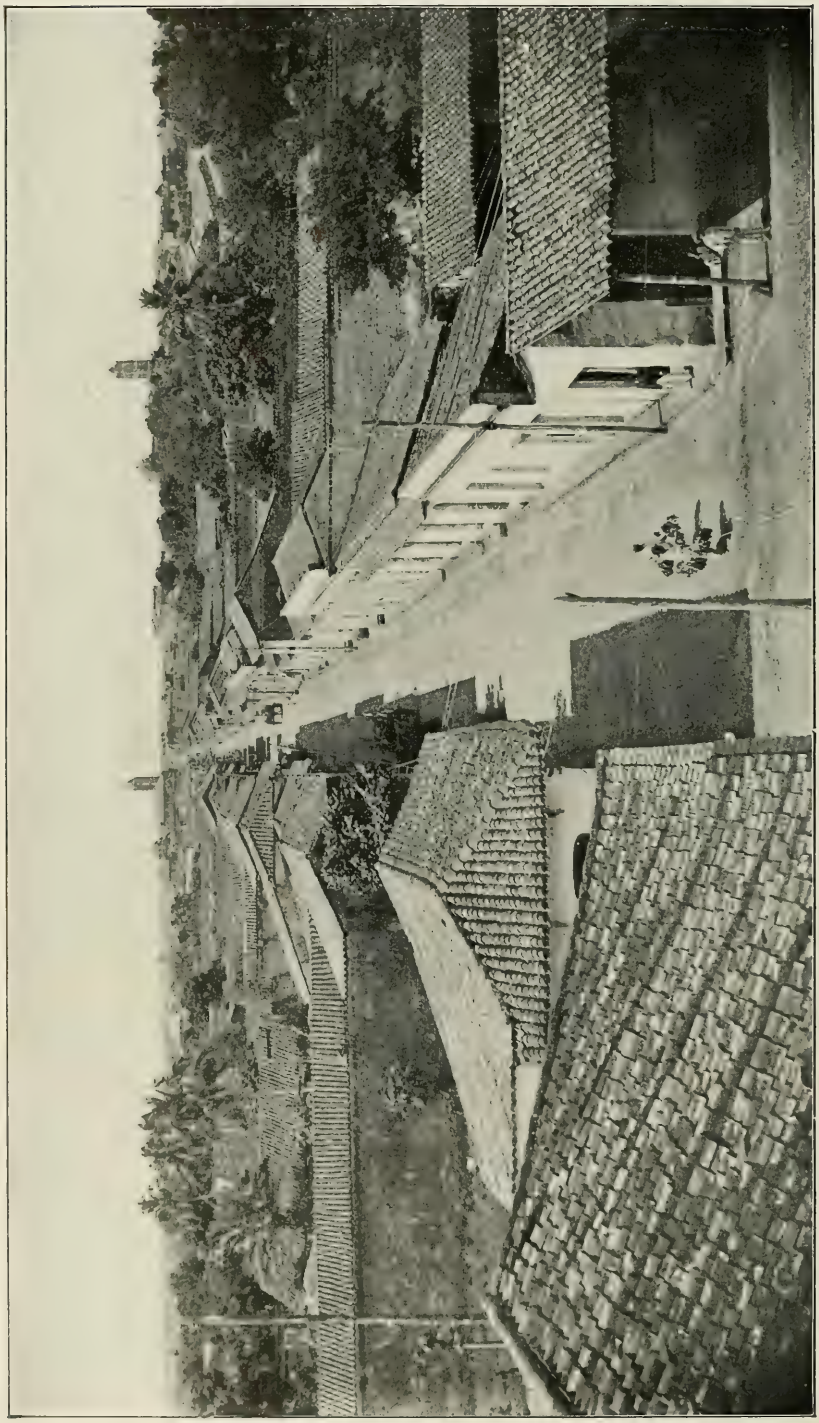
I count it a peculiar honor, as representing the executive of this island, to take part in the exercises of this university. It is of special interest and an honor to me because it was my good fortune when exercising executive functions in the Philippine Islands to take part in a similar function in the university founded by the same order and under similar influences more than a hundred years before this one. Members of the Latin race, not without reason, characterize the Anglo-Saxon race as abrupt and conceited in our view of our power in pushing civilization, but those who have had occasion to come close to the Spanish race know that the Anglo-Saxon race has much to learn from the intellectual



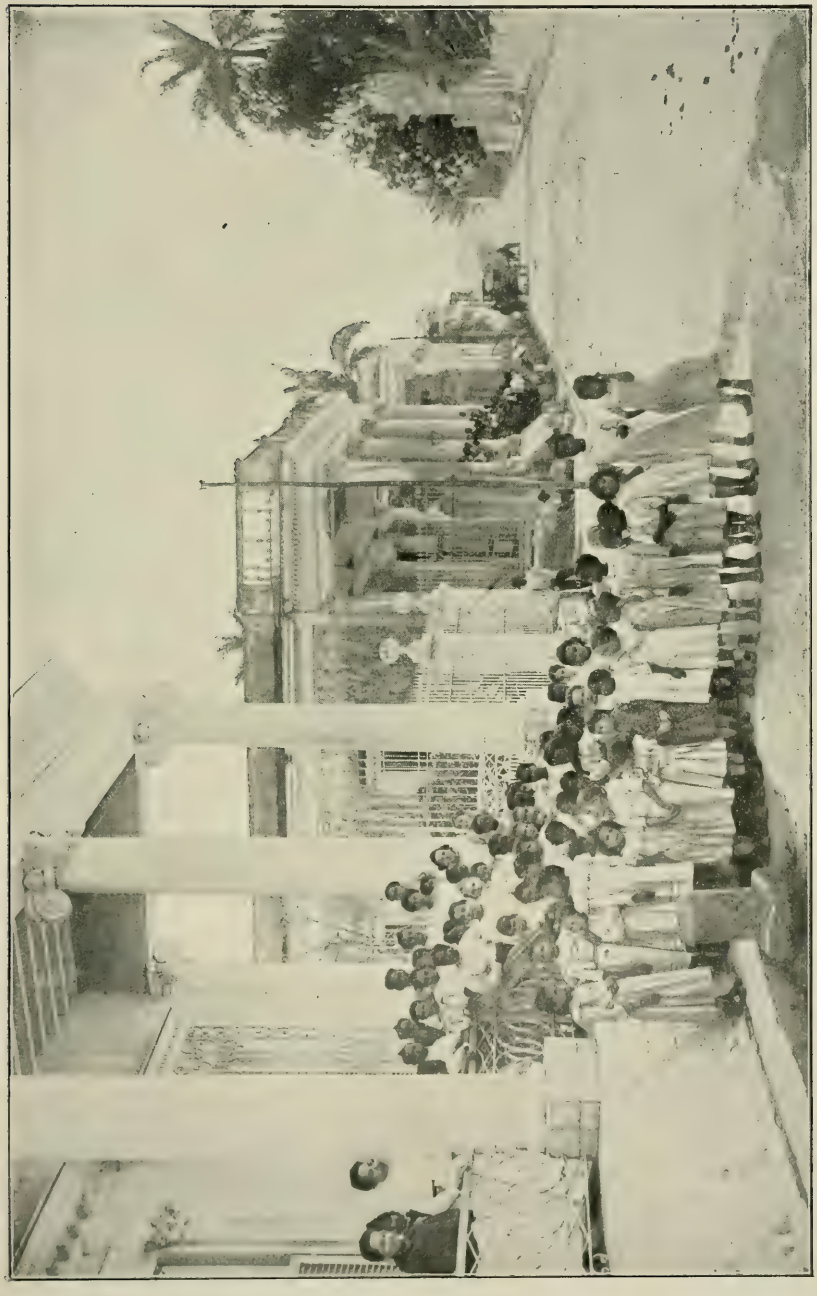
Climbing the Royal Palm

An Avenue of Royal Palms, Matanzas

A Cocoa Grove



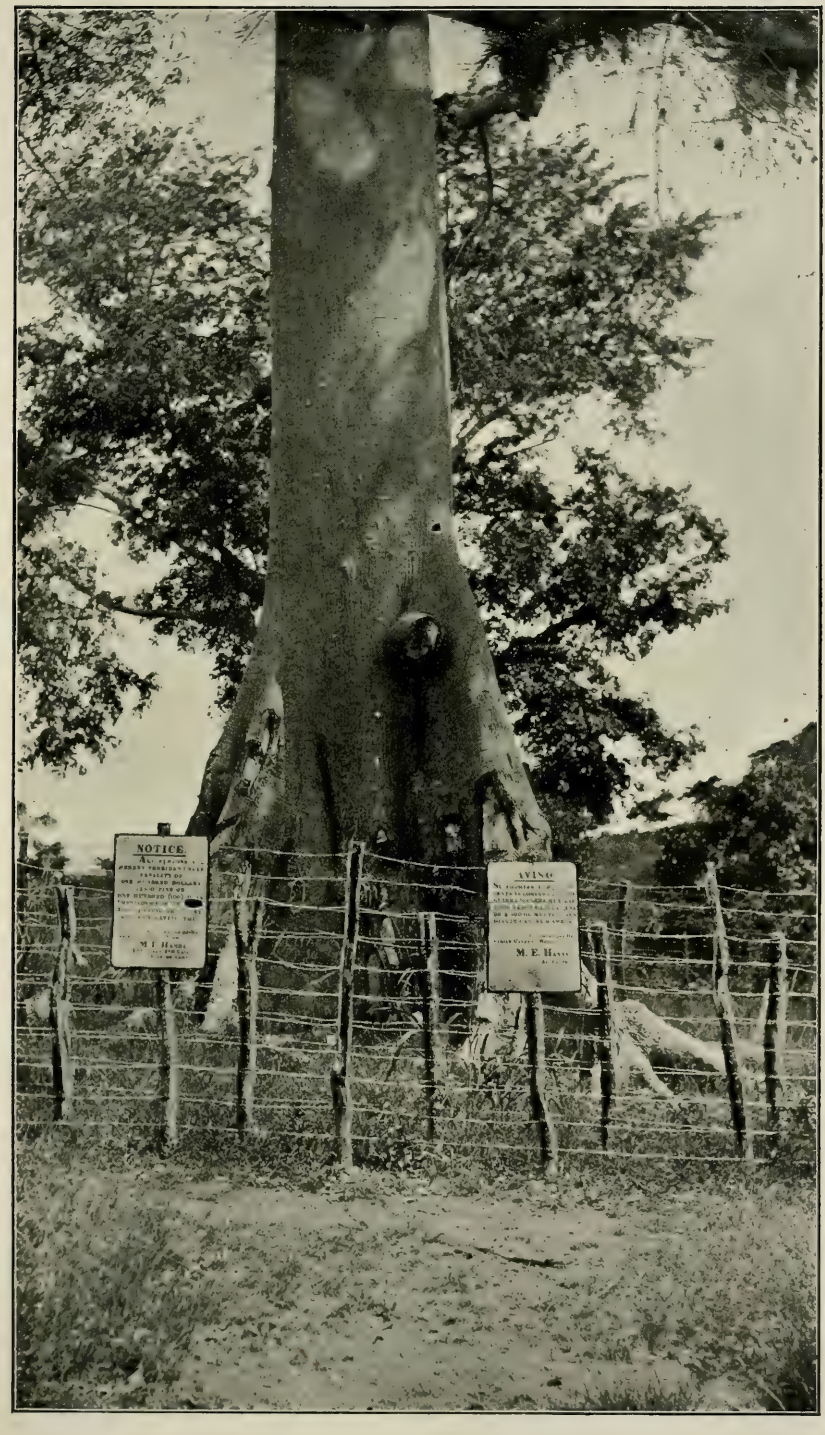
City of Camagüey (formerly known as Puerto Principe), a City of 25,000 Inhabitants



Public School, Matanzas

The attention the Cuban government has given to education is shown by the fact that $3,750,000, or more than 20 per cent of the general budget of the nation, is dedicated to public instruction

Class in the Corridor of the Royal College of Habana



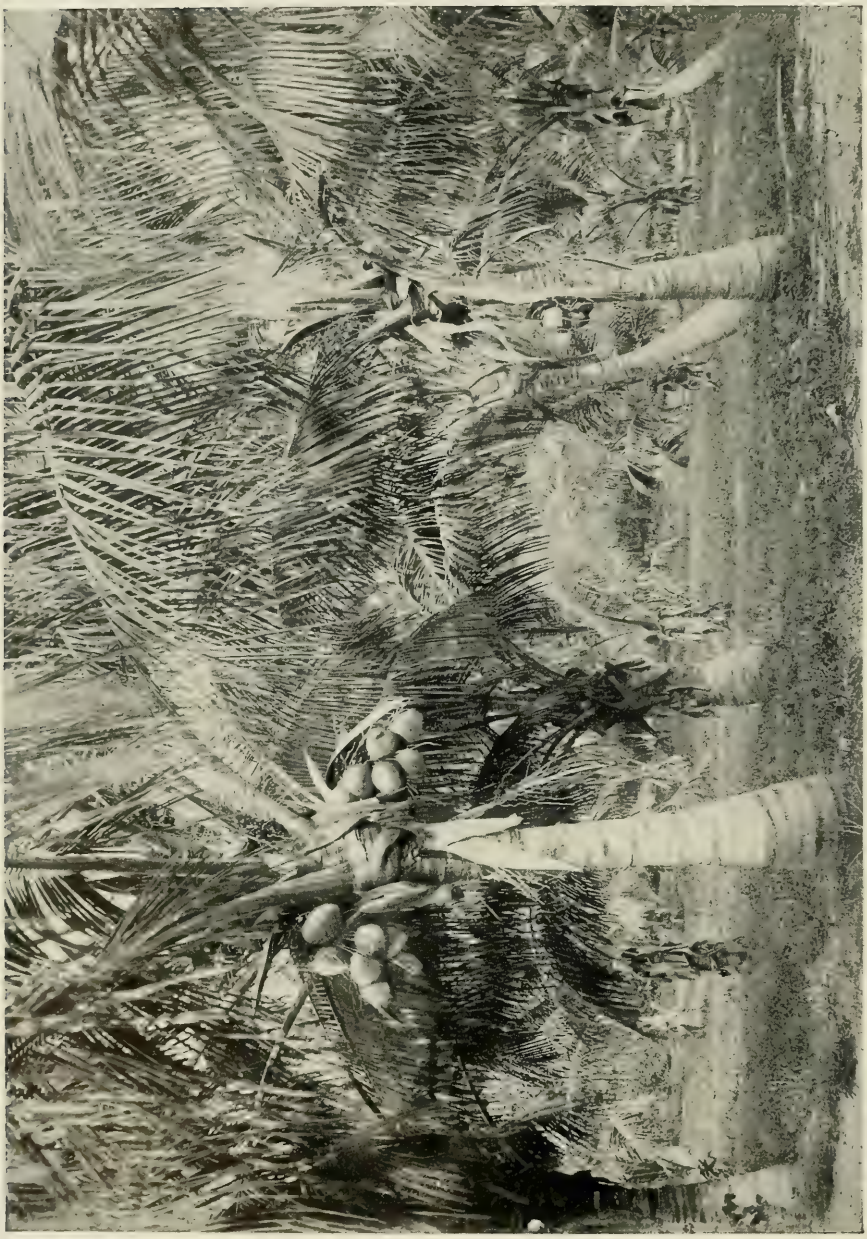
The Surrender Tree near San Juan Hill

Cutting and Stripping Cane

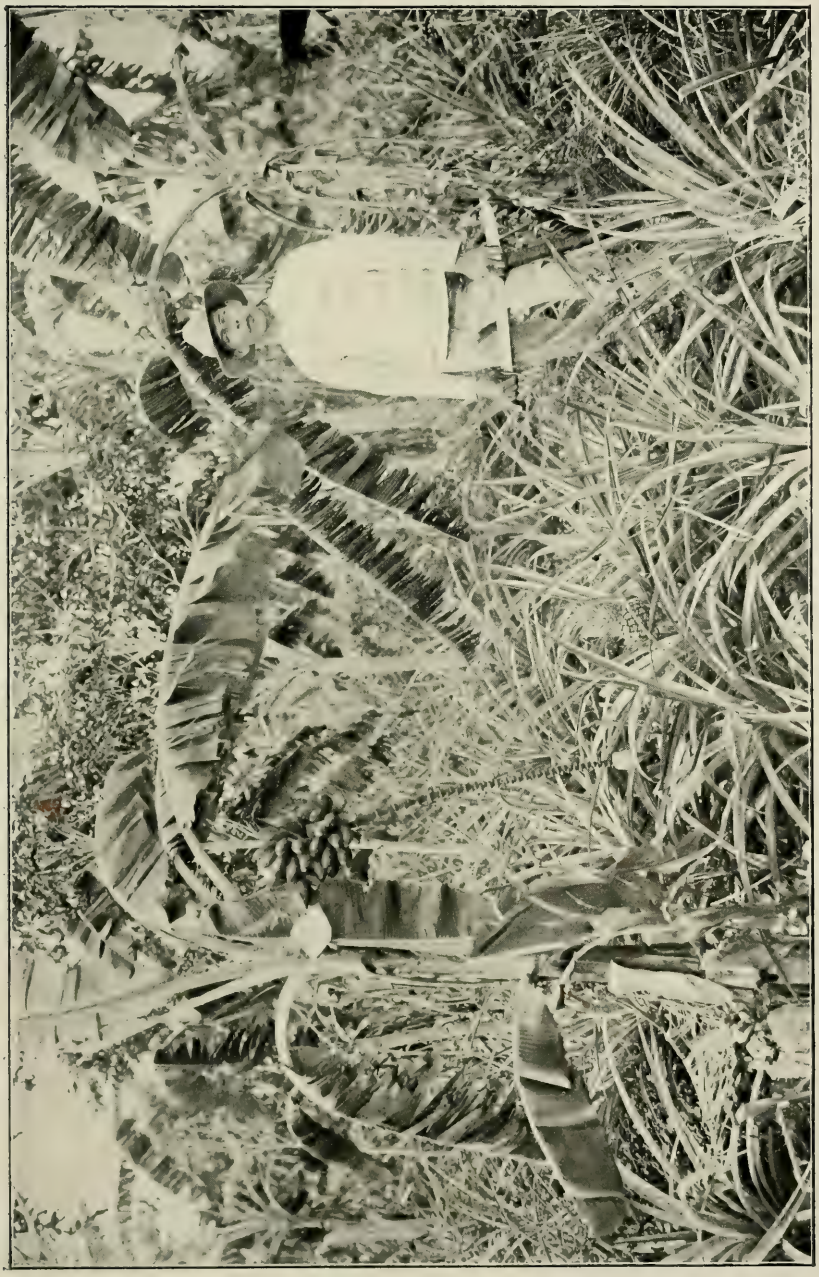
Cuba sent the United States $60,000,000 worth of sugar cane during the year ending June 30, 1906

Transferring Cane to Sugar Mill

The crop of sugar cane in 1905 was about 1,100,000 tons; in 1894, just before the last revolution, it was 1,054,000 tons; in 1897, in the midst of the revolution, it was 212,000 tons



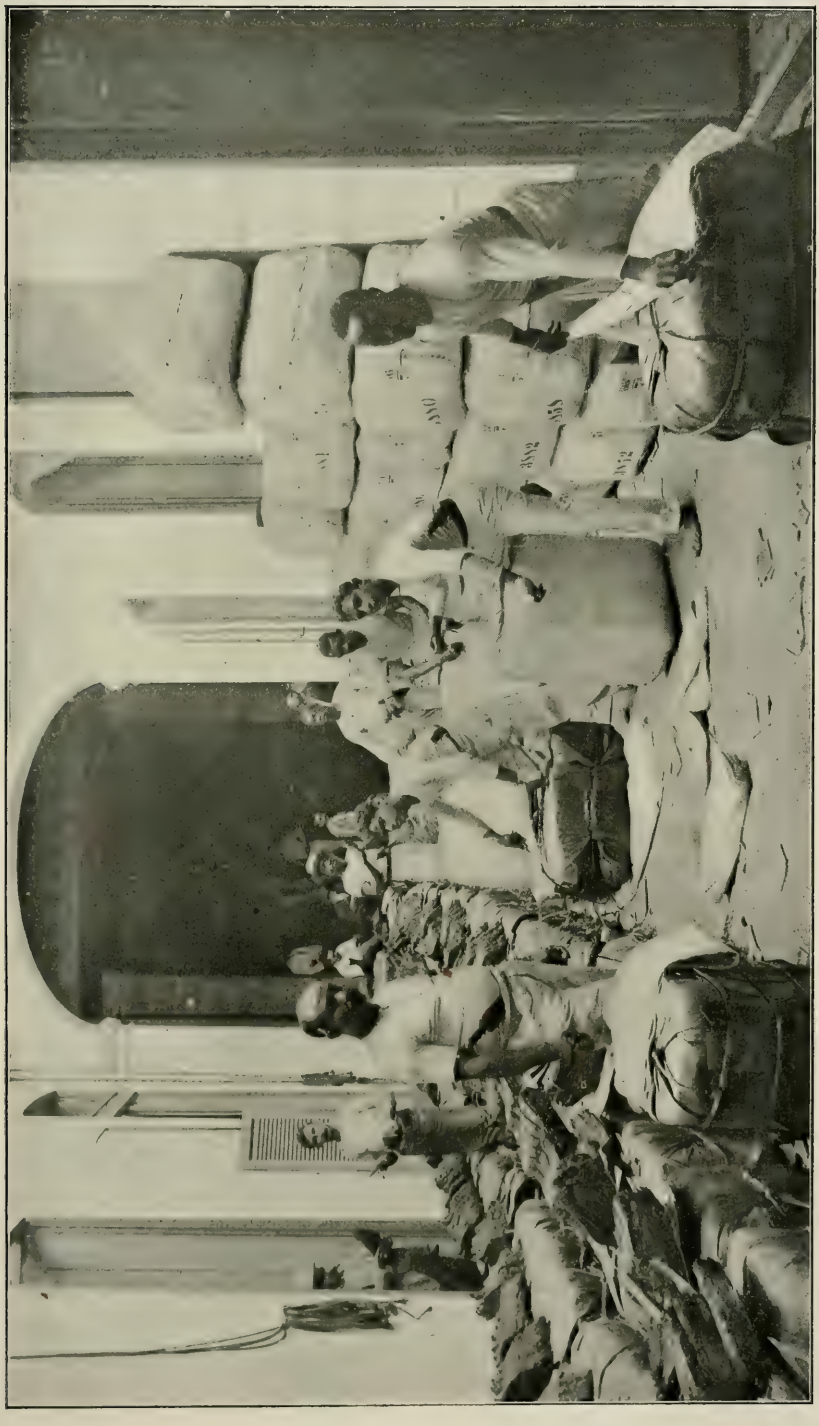
Grove of Cocoanut Trees



Ready for Picking Bananas

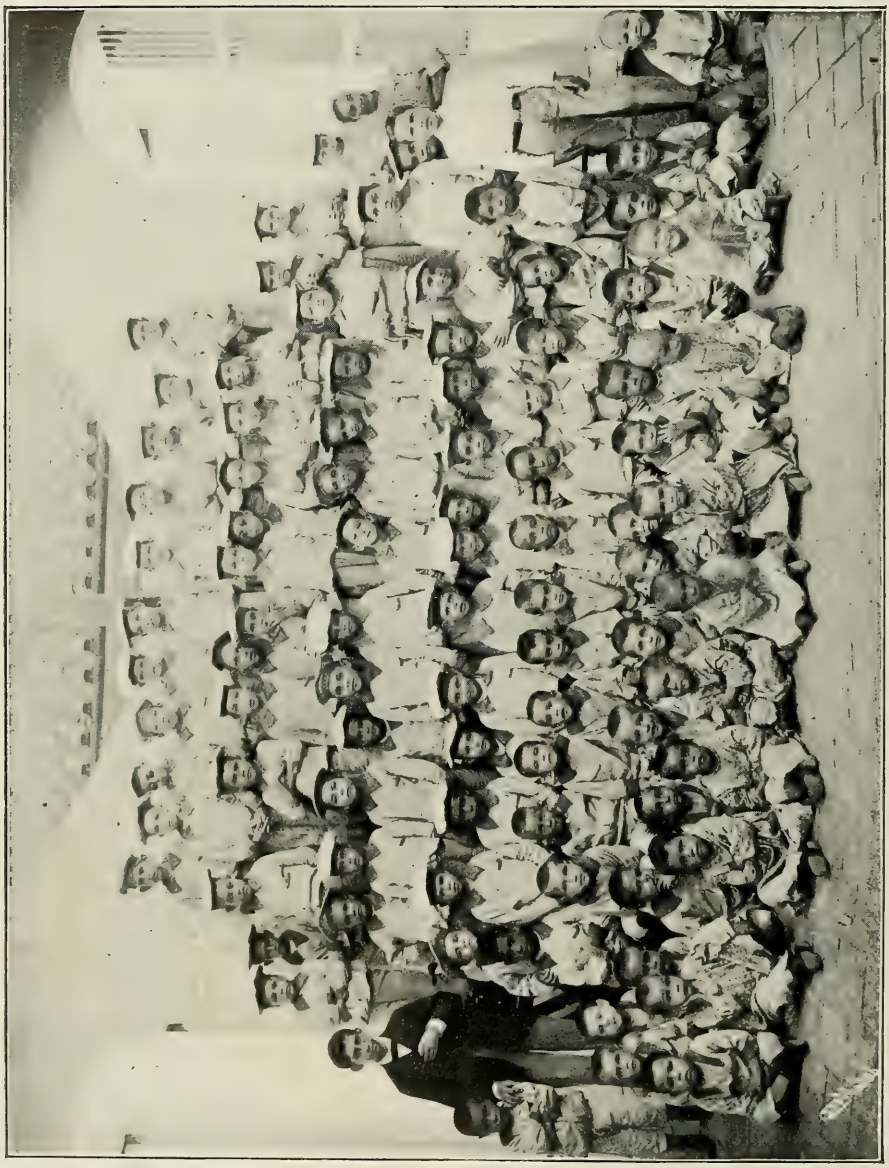
A Tobacco Plantation

In 1904 Cuba exported 205,244,000 cigars, of which 45,000,000 went to the United States, 28,390,000 to Germany, and 92,560,000 to England. In 1859 Cuba exported 250,000,000 cigars, of which 102,000,000 went to the United States



Baling Tobacco

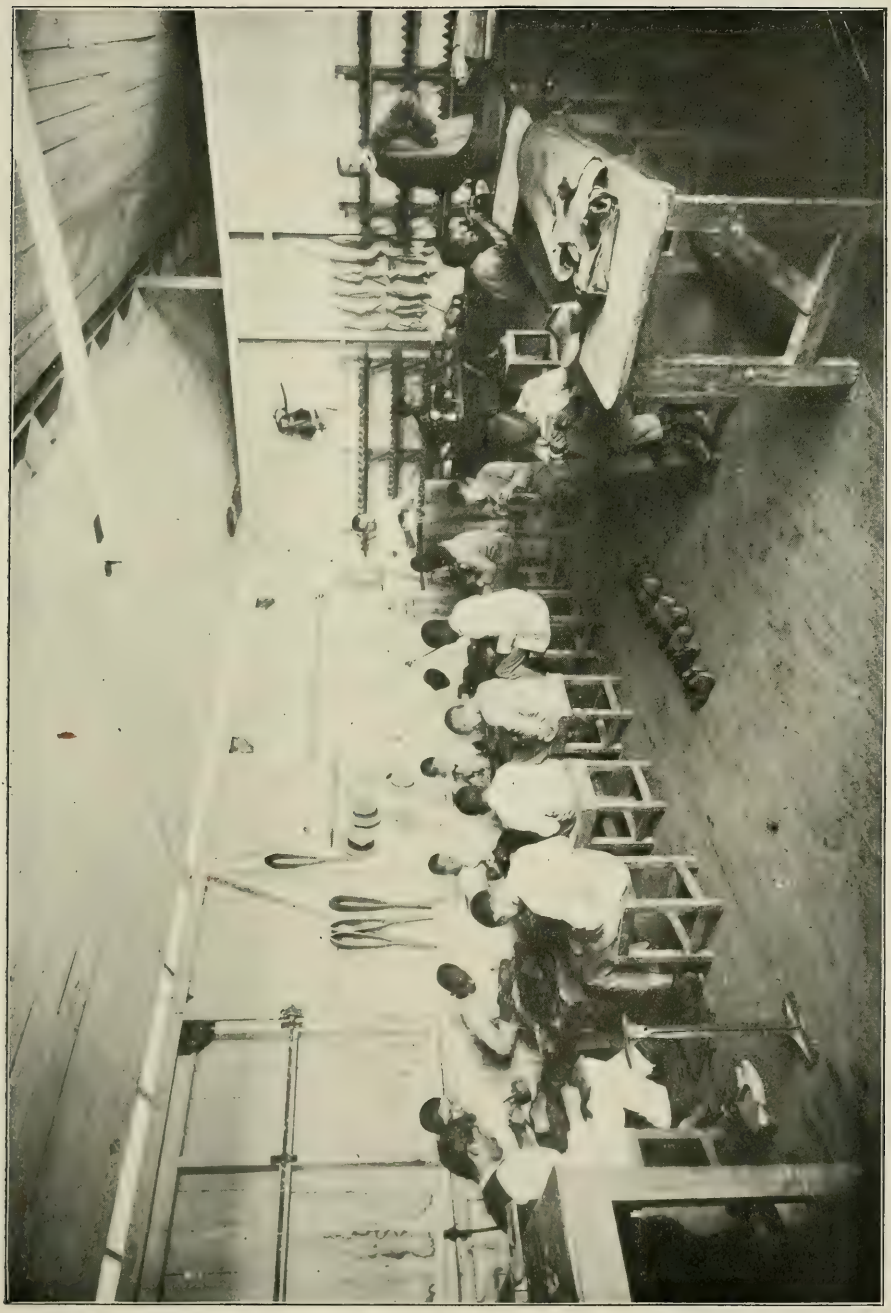
Cuba sent the United States during the year ending June 30, 1906, leaf tobacco valued at $13,500,000, and cigars and cigarettes valued at $4,000,000



Group of Orphans, Matanzas

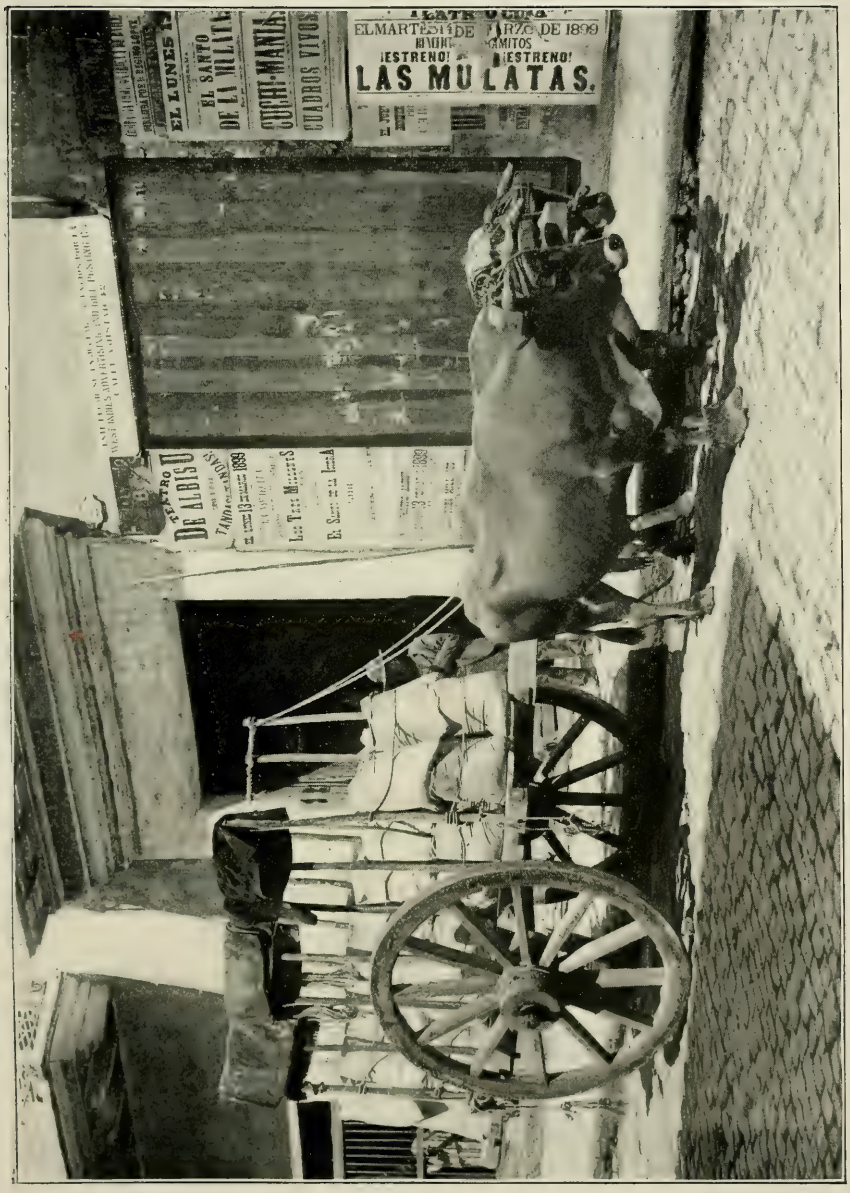
Destitute Children Employed in Street Cleaning at Guanabacoa

Reform School for Boys of Cuba, Guanajay, Cuba. Tailor Shop

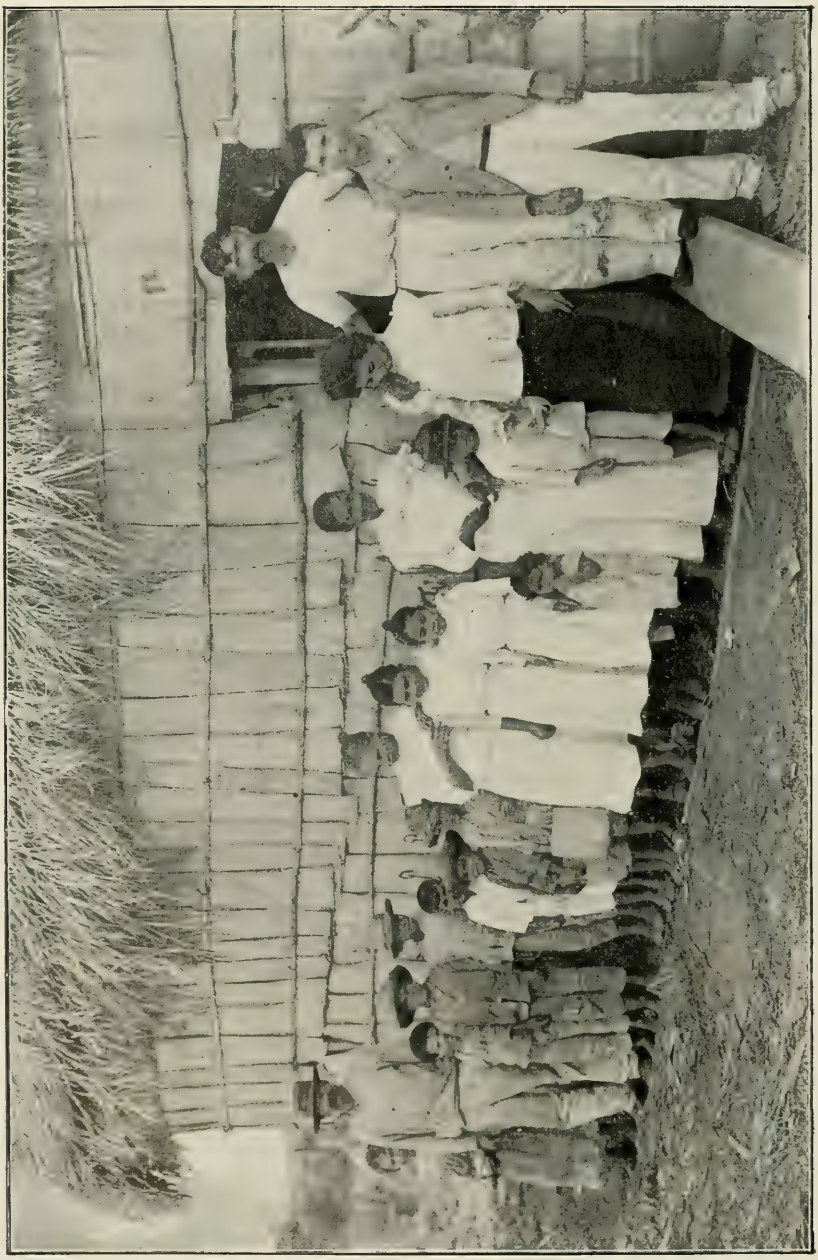


Reform School for Boys of Cuba, Guanajay, Cuba. Shoe Shop

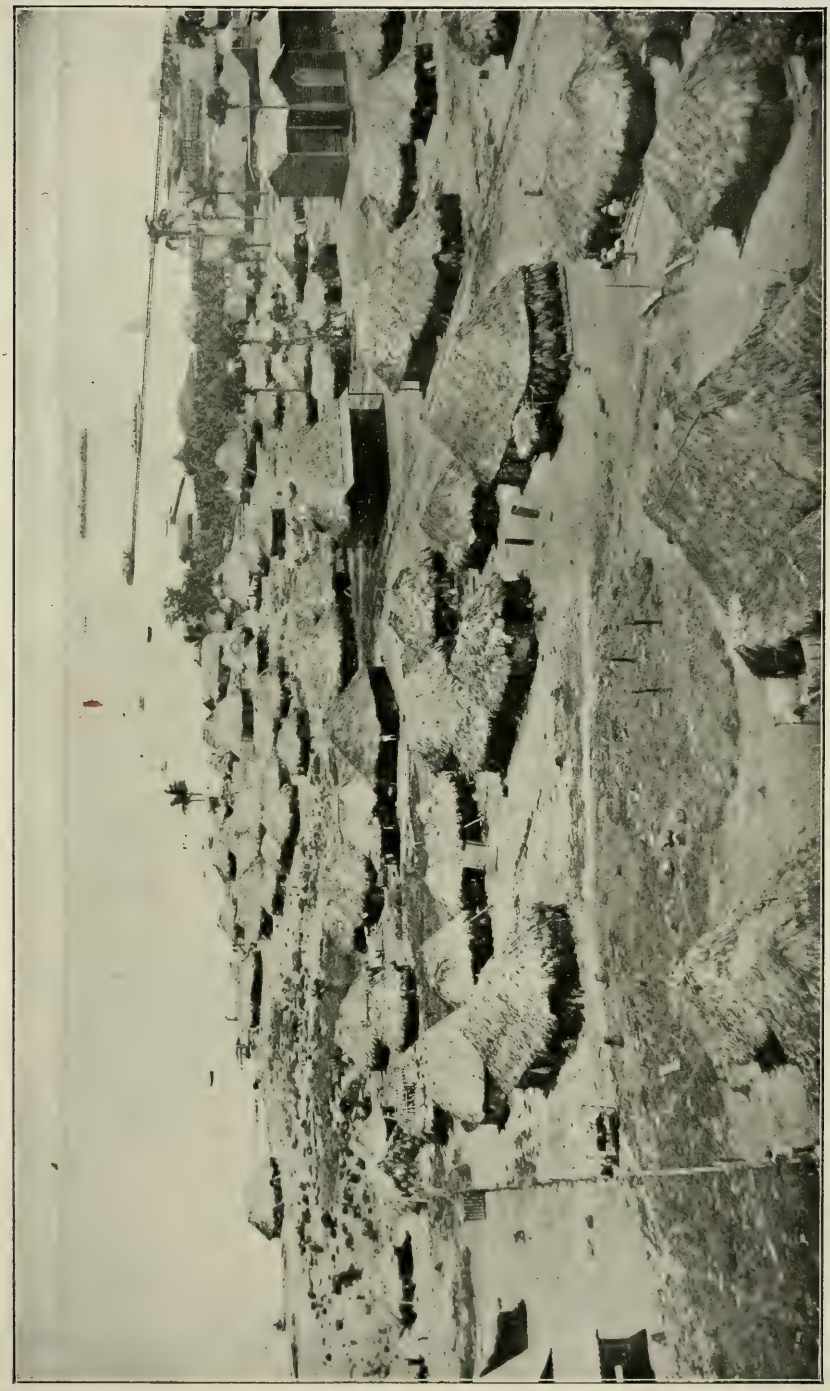
Reconcentrados, near Habana, 1898



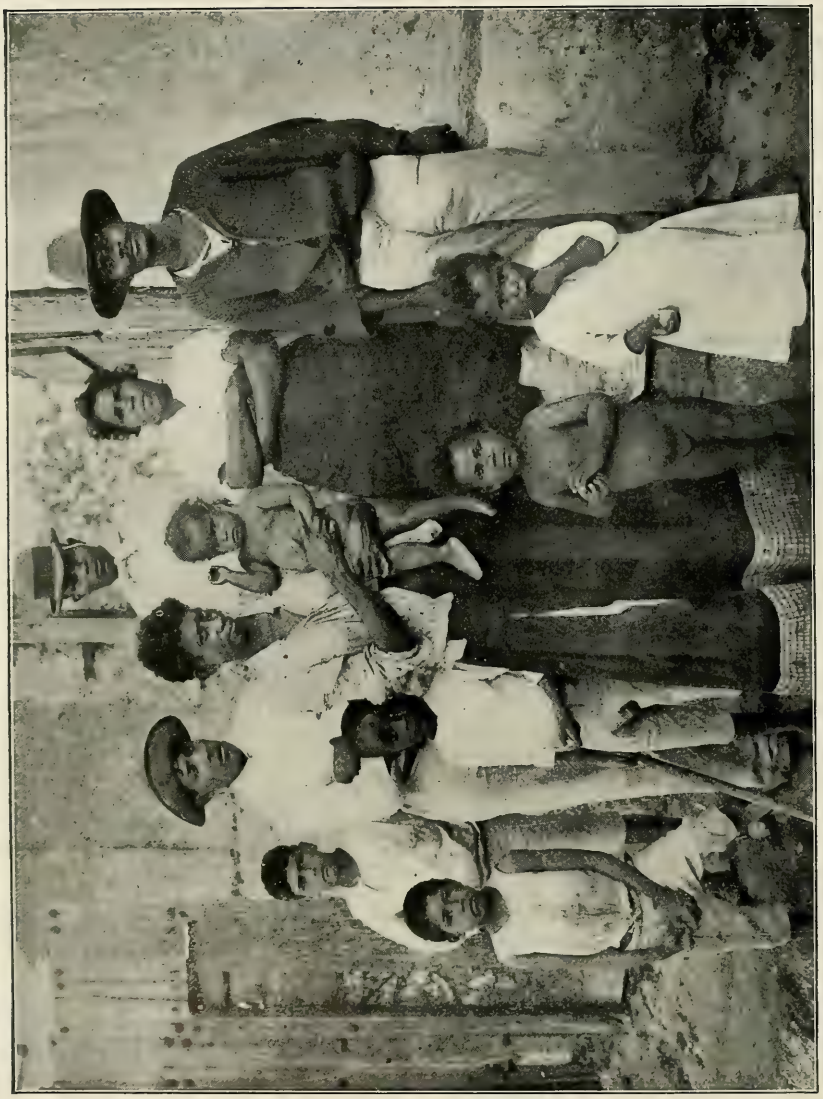
Cuban Wagon Transportation



Native White Family



Dimas, a Village in Pinar del Rio



Native Colored Family

Reform School for Boys of Cuba, Guanajay, Cuba. Group of Boys in Habana, Sentenced to Reform School

Municipal Hospital, No. 1, Habana, Cuba. Instruction of Student Nurses in Massage

refinement, logical faculties, artistic temperament, poetic imagery, high ideals, and courtesy of the Spanish race.

THE TREMENDOUS FORCE OF SPANISH CIVILIZATION

One must know the history of these colonies to realize the tremendous force Spain exerted in civilization and progress. The great public works Spain erected the world over testify to her patience and enterprise in the centuries when the Anglo-Saxon world was struggling with something much less pretentious; but the civilization of Spain was founded on the idea of contral by one man or a few men in the state, and that idea has ceased to have force in the world. In the Anglo-Saxon world the principle was early brought to the front that those who had education enough to know what their interests were were more safely to be trusted with determining how those interests should be preserved than one man or a few men. Because in that respect and in the development of that idea we have the advantage of 200 years of education in self-government, we plume ourselves with superiority in the matter of knowledge of government.

Now we have arrived at a stage where the attention of the world is being directed toward the tropics, and along with this attention comes the movement toward popular government. Cuba, established as a republic four years ago, made such rapid progress as almost intoxicated those of us who believed in popular government. It was very much like the growth of a tropical plant that needed, possibly, to be cut back in order that the stem gain strength. It was perhaps necessary that this people should have warning, sad as the warning was, that the foundation upon which popular self-government must be laid must be broad and solid rather than high and conspicuous.

It was sad to me to be called to this island (it was still sadder to my chief, President Roosevelt, who was so identified with the liberation of this island), to be here at a time of a stumble in progress toward self-government. But, however that may be, it has given us an opportunity, which I am now glad to be able to take, to assure you in the name of President Roosevelt and the American people that we are here only to help you on, with our arm under your arm, lifting you again on the path of wonderful progress you have traveled.

I am confident that we will be able again to point with pride to the fact that the United States is not an exploiting nation, but only has such deep sympathy with the progress of popular government as to be willing to expend its blood and treasure in making the spread of such government in the world successful.

ALL CLASSES MUST TAKE AN INTEREST IN POLITICS

Your difficulty was that you were brought up under the fifteenth and sixteenth century ideas of government, the government of one man or a few men, and that you were taught to look to somebody else for the responsibility of government. You exercised only the function of criticism, and most of your people, especially those of the wealthy and educated classes, trained themselves to occupy a position not of indifference but of inactivity with reference to political and governmental matters.

Now it seems I find here a relic, although the reasons for it have disappeared, of that condition, and I find the law committed one class to medicine, left another class to commercial interests, a third class to political matters. I venture to suggest that all classes did not take an active part and insist upon exerting their influence in politics.

The question naturally arises, What was the necessity for changing your form of government? The theory of popular government is that all classes shall exercise decided political influence. Now I have discovered, it seems to me, that your ideals were too high, so high as to reach beyond the real. Ideals so high that they are beyond the reach of the real are not

very useful. Soaring in the blue ethereal without knowledge of the ground beneath is dangerous. The higher you go the more disastrous the fall, as a distinguished speaker of the day said.

The hope of this country is in the generous, educated youth who are graduating from this and other institutions. Now, I do not want to say anything that is going to deter these young men, and yet I must speak the truth. There are one or two traditions that still persist in this civilization, the first of which is that the learned professions are the only pursuits worthy of the graduates of universities and of educated men. This is a great mistake.

In the first place, a university education is not an obstruction to success in commercial and mercantile life. I am afraid the young Cubans coming forward are not sufficiently infused with the mercantile spirit, of which we have too much in America. What you need here among the Cubans is a desire to make money, to found great enterprises to carry on the prosperity of this beautiful island, and young Cubans ought, most of them, to begin in business. In the next generation the banks, commercial houses, and shipping interests of this country should be in Cuban hands, not those of foreigners.

It is quite true that in order to develop Cuba you must have foreign capital, and a profound debt of gratitude this country owes to that great man, Tomas Estrada Palma. He realized more than any of the Cuban people the necessity for bringing capital into the island.

But the coming of foreign capital is not at all inconsistent with the gradual acquirement of capital by industrious, intelligent and energetic Cubans. Therefore I urge upon the young men who are going out into life today that they devote their attention, if they have estates, to the betterment of those estates, and upon the others, who have no estates, that they get into commercial houses and commercial pursuits, so that when twenty-five years hence sympathetic strangers come here they will not find the governing or political class, the commercial class, and the class representing the sciences and professions all different and divided.

It gives me great pleasure in saying this much to you, and I wish to thank the rector of the university and the faculty. I have only to say, be not discouraged. No one ever achieved a high ideal without failing two or three times. The only way to make failures successes is to make those failures a vehicle leading on to success. Take to your hearts the lesson that each stumble, each failure, ought to teach, and the next time avoid that particular danger. When everything is smooth, when the winds blow the right way, when you seem on the high road, then is the most dangerous time. It is when humbled by the lesson taught by disappointment that you win success. I thank you.

Viva la Republica de Cuba.

The immigration into Cuba has increased very rapidly. In 1902 it was 11,898; in 1903, 17,844; in 1904, 28,467; and in 1905, 54,221. The figures do not include colonists and settlers from the United States who are not classed as immigrants and of whom no statistics are kept. About 87 per cent of the immigrants, or 48,000, in 1905 were from Spain. The number of Americans in Cuba, excluding the Isle of Pines, probably does not exceed 6,000. Of the $120,000,000 of United States money invested in Cuba, probably one-half is in sugar and tobacco, one-fourth in railroads and street railways, and the balance in real estate, mortgages, mines, commercial interests, and fruit culture.

OSTRICH FARMING IN THE UNITED STATES

OSTRICH farming in the United States, while still in its infancy, is becoming a profitable industry in Arizona and California, and it is believed that in a few years we shall not be obliged to import ostrich feathers from abroad. Mr Watson Pickrell, in the last yearbook of the Department of Agriculture, gives an exceedingly interesting account of the growth of this industry, from which the facts in this article are derived.

More than half the ostriches now in the United States are the progeny of a single pair owned in Arizona in 1891. Great progress has been made in the last five years, and there are now 2,500 ostriches on farms in the United States. Of these, 1,740 are in Arizona and the remainder in California, Florida, and Arkansas.

Where good alfalfa pasture has been available, the birds bred in America have grown larger than those first imported. A full-grown fat ostrich will weigh from 375 to 450 pounds. He will stand 8 feet high, but can easily reach to a height of 10 or 11 feet.

Ostriches thrive best in a warm, dry climate, but can be grown in any part of the southern states and territories of this country. In a moist climate they should have protection from cold and rain.

Ostriches come to maturity when about four years of age. The female matures from six months to a year before the male, but she will seldom lay a fertile egg until she is 3½ years old. The nest is a round hole in the ground, which the male scoops out with his feet. At first the female may not take the nest, but may lay her first eggs on the ground; whereupon the male will roll them into the nest. Generally, after the male has put 3 or 4 eggs in the nest, the female will lay there. In about 30 days she will lay 12 to 16 eggs, and will be ready to commence incubation. Incubation takes 42 days. Any good, well regulated incubator can be successfully used, provided it is constructed on a large enough scale to accommodate ostrich eggs, which are 5 inches in diameter and 7 inches long.

The ostrich is plucked the first time when six months old, and should be plucked about every eight months thereafter during its lifetime. The only feathers removed are those of the wing and tail. The process of plucking consists in cutting the tail feathers and one row of the largest quill feathers in the wing with pruning shears, and drawing by the hand those of the remaining two or three rows in the wing. Two months later the

From Watson Pickrell, U. S. Department of Agriculture

Ostriches 5 Days Old, Salt River Valley, Arizona

Young Ostriches, South Pasadena, California

From Watson Pickrell, U. S. Department of Agriculture.

Ostriches 5 Months Old, Salt River Valley, Arizona

quills of the cut feathers may be removed. At plucking time the ostriches are driven in from the pasture and placed in a small pen surrounded by a tight board fence 5 or 6 feet high. The plucking box is about 4 feet high, 20 inches wide, and 3½ feet long, open at one end and closed with a door at the other. An ostrich is caught and a hood placed over its head. The hooded bird is very easily handled. It is placed in the plucking box with its head next to the closed door. The plucker stands behind the bird while removing the feathers. This is necessary, because the ostrich can kick or strike very hard, but it always strikes out in front and never behind, so that the plucker is perfectly safe if he stands in the rear.

In sorting, the feathers of the male, being more valuable, are kept separate from those of the female.

The United States is one of the largest consumers of ostrich feathers in the world. During the fiscal year 1903-'4 there was imported into this country $2,292,515 worth of "raw" or "unmanufactured" feathers. The feathers produced in America are fully as good as those coming from Africa, and it is claimed that they are broader and finer looking, though some of the manufacturers contend that they are not as strong and tough as the wild feathers. There seems to be no reason why ostrich farming may not be developed sufficiently in Arizona and California alone to supply all the feathers consumed in America.

Young ostriches are usually kept in troops of 25 to 50. When they are one year old the males should be separated from the females. When they are 3½ years old the birds should be paired off, each pair being placed in a separate inclosure, which, in case the birds are to graze on alfalfa or other green food, should be large enough to furnish them sufficient food. If they are fed on dry

Full Grown Bird at Ostrich Farm, South Pasadena, California

From Watson Pickrell, U. S. Department of Agriculture

Plucking an Ostrich, Salt River Valley, Arizona

feed the inclosure need only be large enough to allow plenty of exercise.

Ostriches are easily removed from one field to another by one person going ahead, calling them, and leading them on with grain, while another follows on a horse. The birds are very timid and do not like to be driven unless some one goes ahead of them.

After ostriches are over one year old no one should go among them without a brush or stick in the hand, as at times they will want to fight, and a person going among them is liable to injury unless he has something with which to drive or frighten them away.

Although African writers assert that ostriches will live without water, Arizona farmers find that they drink water freely every day if it is supplied to them.

Nothing is positively known as to how long an ostrich will live. Some writers claim that it will live one hundred years. Ostriches which are known to have been in captivity for forty years are still breeding and producing feathers. It is the experience of Arizona farmers that among birds having good nutritious green feed deaths seldom occur, except as the result of an accident. A dog or other small animal will sometimes frighten ostriches and cause them to run into the fence, which may result in a broken leg. When this happens the bird may as well be killed, as few ever recover from such an injury.

Chicks 6 months old may be set down as worth $100 each; 1-year-old birds, $150; 2-year-old birds, $200 to $250; birds 3 years of age, $300 to $350, and birds 4 years old, the age which they pair, $800 or more per pair.

An ostrich will yield annually 1½ pounds of feathers, with an average value of $20 a pound, and from 36 to 90 eggs, which may be used for incubation or may furnish egg food at the rate of 3½ pounds to the egg, if the owner does not wish to increase his troop.

At Los Angeles, California

THE PASSING OF KOREA*

HOMER B. HULBERT, for many years resident of Korea and editor of the *Korean Review*, is the author of a new book, entitled "The Passing of Korea," published this month by Messrs Doubleday, Page & Co., of New York. It is undoubtedly the most reliable and interesting volume on this people that has been issued in many years. Mr Hulbert sympathizes very deeply with the Koreans in their loss of independence, and feels that they have been harshly treated by the Japanese. Unquestionably it is a sad fact when a nation forfeits its independence, but this must occasionally happen in the progress of the world. While many will differ from Mr Hulbert in his judgment as to the justice of the Japanese advance through Korea, every one must admire the sympathetic and eloquent manner in which he outlines the history and describes the manners, customs, and personality of the country, and will profit by as well as greatly enjoy the reading of the book. Through the courtesy of the publishers, the NATIONAL GEOGRAPHIC MAGAZINE is enabled to republish several of the striking and typical illustrations from the volume, and to give the following extracts:

There is a peculiar pathos in the extinction of a nation. Especially is this true when the nation is one whose history stretches back into the dim centuries until it becomes lost in a labyrinth of myth and legend—a nation which has played an important part in the moulding of other nations and which is filled with monuments of past achievements. Kija, the founder of Korean civilization, flourished before the reign of David in Jerusalem. In the fifth century after Christ, Korea enjoyed a high degree of civilization and was the repository from which the half-savage tribes of Japan drew their first impetus toward culture.

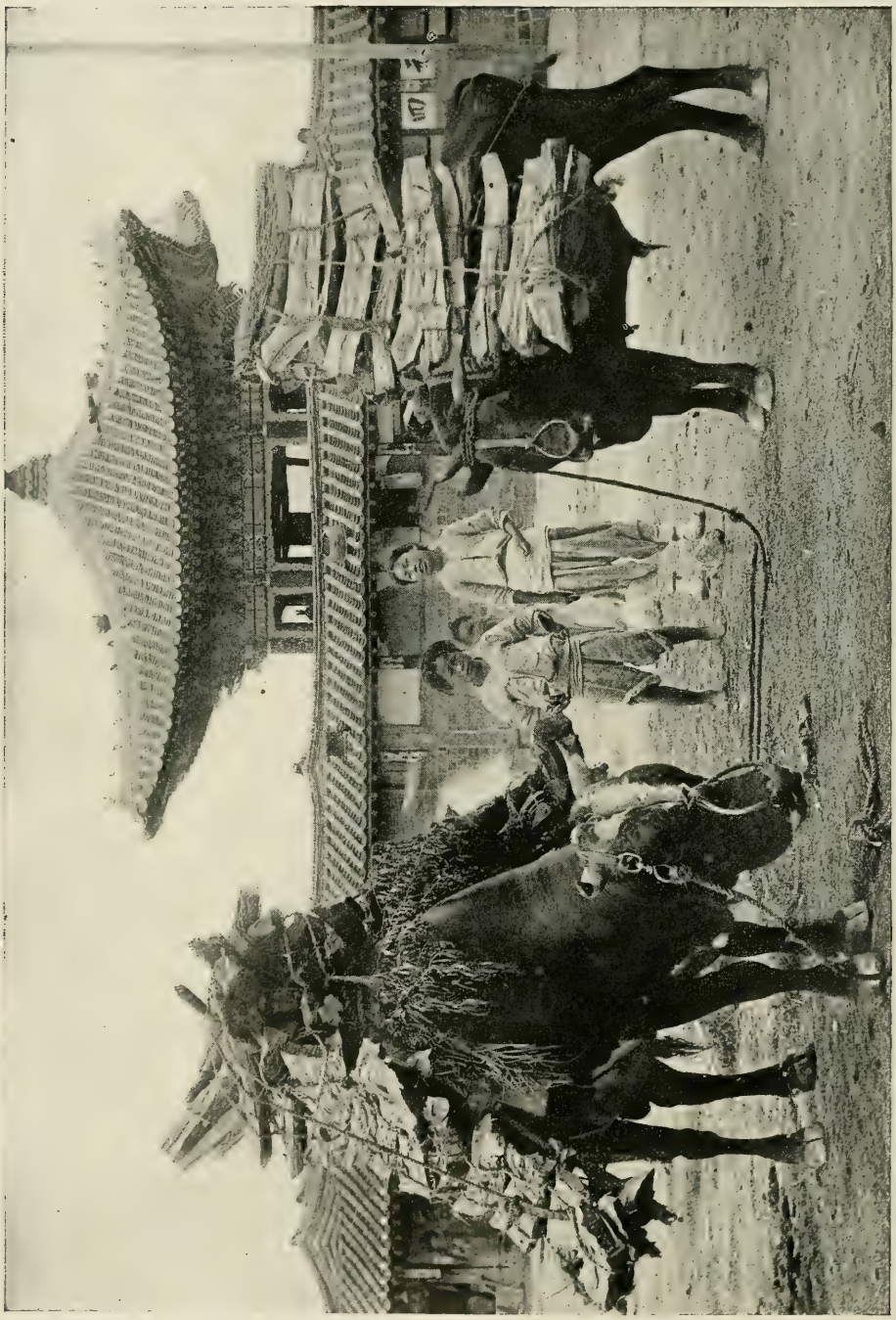
The American public has been persistently told that the Korean people are a degenerate and contemptible nation, incapable of better things, intellectually inferior, and better off under Japanese rule than independent. The following pages may in some measure answer these charges, which have been put forth for a specific purpose—a purpose that came to full fruition on the night of November 17, 1905, when, at the point of the sword, Korea was forced to acquiesce "voluntarily" in the virtual destruction of her independence once for all.

Topographically Korea lies with her face toward China and her back toward Japan. This has had much to do in determining the history of the country. Through all the centuries she has set her face toward the west, and never once, though under the lash of foreign invasion and threatened extinction, has she ever swerved from her allegiance to her Chinese ideal. Lacordaire said of Ireland that she has remained "free by the soul." So it may be said of Korea, that, although forced into Japan's arms, she has remained "Chinese by the soul."

The scenery of Korea as witnessed from the deck of a steamer is very uninviting, and it is this which has sent so many travelers home to assert that this country is a barren, treeless waste. There is no doubt that the scarcity of timber along most of the beaten highways of Korea is a certain blemish, though there are trees in moderate number everywhere; but this very absence of extensive forests gives to the scenery a grandeur and repose which is not to be found in Japanese scenery. The lofty crags that lift their heads three thousand feet into the air and almost overhang the city of Seoul are Alpine in their grandeur.

The vegetable life of Korea is like that of other parts of the temperate zone,

* "The Passing of Korea." By Homer B. Hulbert. Profusely illustrated from photographs. Pp. 475. 7½ by 10½ inches. New York: Doubleday, Page & Co. 1906. $4.18, postpaid.

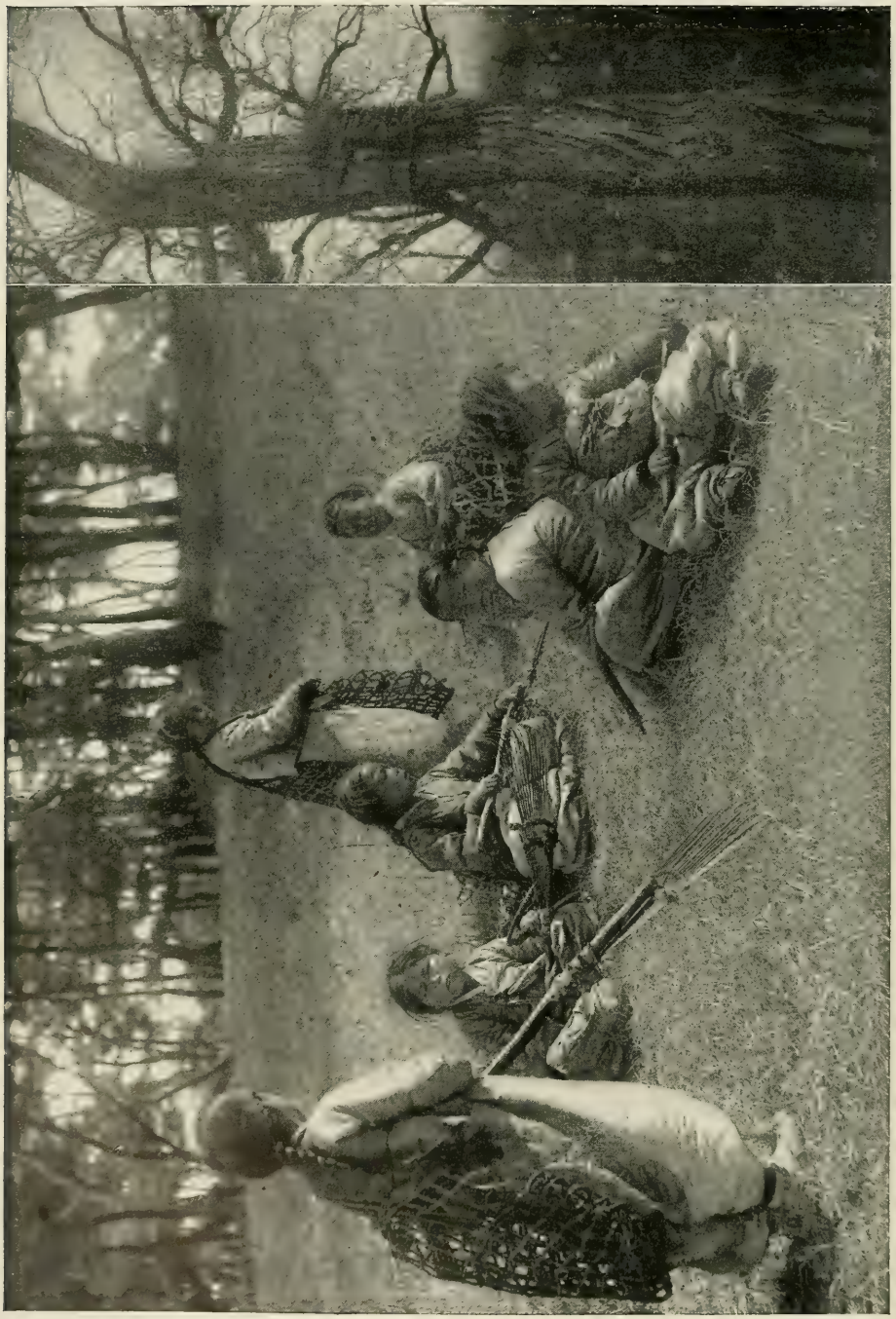


From Hulbert's "The Passing of Korea." Copyright, 1906, by Doubleday, Page & Co.

The Faithful Fuel-carriers of Korea

From Hulbert's "The Passing of Korea." Copyright, 1906, by Doubleday, Page & Co.

Placer Gold Mining in Korea



From Hulbert's "The Passing of Korea." Copyright, 1906, by Doubleday, Page & Co.

Boys Who Gather Grass for Fuel—Dead Child Tied to Tree

From Hulbert's "The Passing of Korea." Copyright, 1906, by Doubleday, Page & Co.

An Interesting Chess Problem

but there is a striking preponderance of almost every kind common to the temperate zone, with the exception of the apple.

The Koreans are great lovers of flowers, though comparatively few have the means to indulge this taste.

As for animal life, Korea has a generous share. The magnificent bullocks which carry the heavy loads, draw the carts, and pull the plows are the most conspicuous. It is singular that the Koreans have never used milk or any of its products, though the cow has existed in the peninsula for at least thirty-five hundred years. This is one of the proofs that the Koreans have never been a nomadic people. Without his bullock the farmer would be all at sea. No other animal would be able to drag the plow through the adhesive mud of a paddy field. Great mortality among cattle, due to pleuro-pneumonia, not infrequently becomes the main cause of a famine. There are no oxen in Korea. Most of the work is done with bullocks, which are governed by a ring through the nose and are seldom obstreperous. Every road in Korea is rendered picturesque by long lines of bullocks carrying on their backs huge loads of fuel in the shape of grass, fagots of wood, or else fat bags of rice and barley.

Korea produces no sheep.

Reputable language is hardly adequate to the description of the Korean dog; no family would be complete without one; but its bravery varies inversely as the square of its vermin, which is calculable in no known terms.

The Koreans differ from the Japanese in that, while the latter keep themselves warm by the use of heavy blankets, and in winter are most frequently seen crouched about their charcoal braziers, the Korean heats his house generously and depends upon his hot stone floor for comfort. The effect, while perhaps no better from a hygienic standpoint, is decidedly more comfortable. It is also much more costly. People have wondered why Korea looks so barren compared with Japan. The reason lies right here: Koreans keep their wood cut down to the quick, to provide themselves with fuel, while the Japanese let the forests grow.

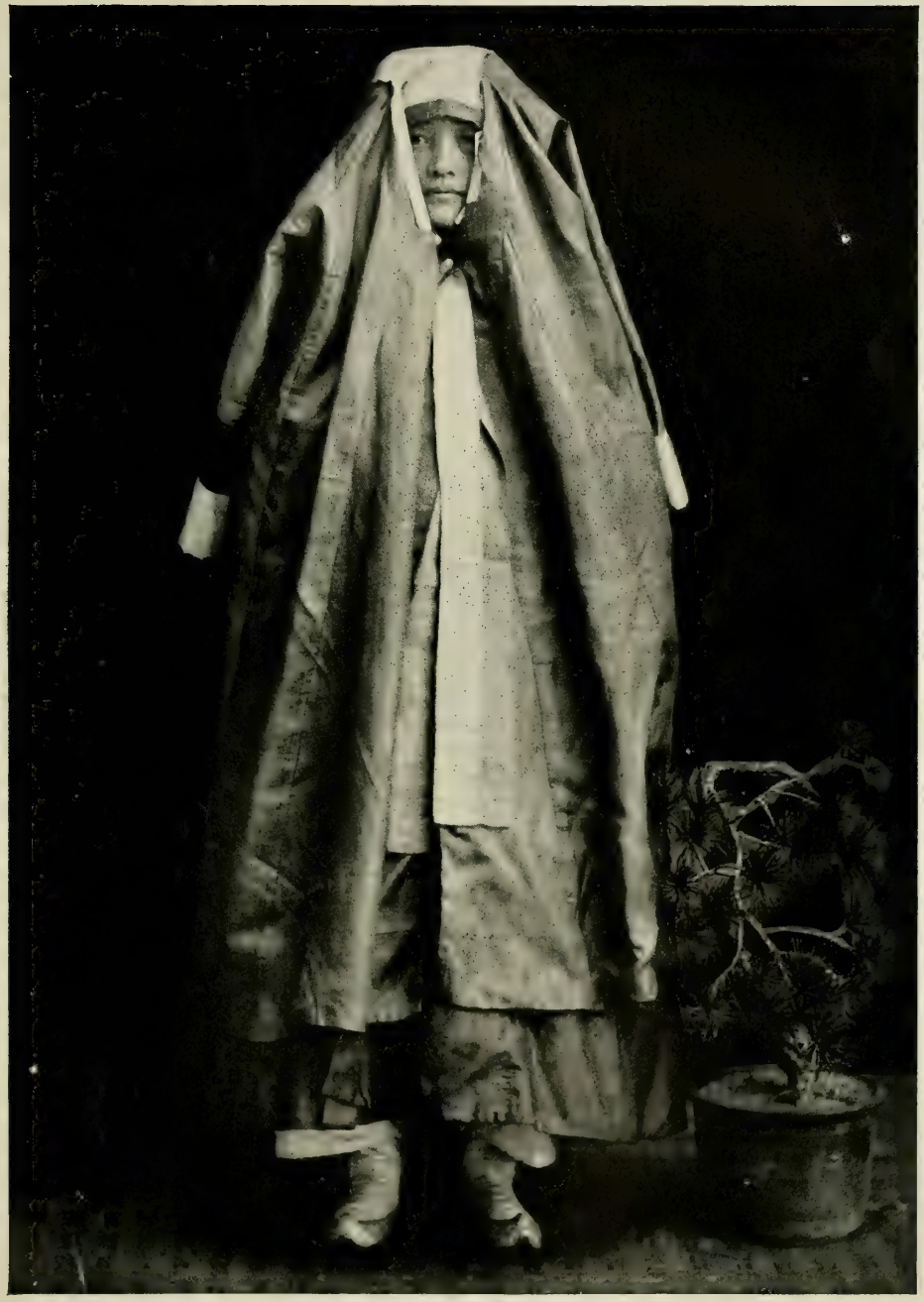
The only way by which the Koreans will be able to preserve their nationality, says Mr Hulbert, is education. The Koreans have awakened to the fact that this, which should have been their first consideration many years ago, is now their last resort, and they are clamoring for education.

RUSSIA'S WHEAT SURPLUS

SOME interesting facts are given about the Russian peasants and the agrarian question in a bulletin recently issued by the Department of Agriculture, entitled "Russia's Wheat Surplus." The report was prepared by Dr I. M. Rubinow and is one of a series dealing with the competitors of the United States in agricultural products.

The Russian wheat crop has increased from 400,000,000 bushels in 1896–1898 to 630,000,000 bushels in 1902–1904. The wheat area is over 10,000,000 acres larger than that of the United States, and in 1903 and 1904 the Russian crop exceeded the crop of this country.

Nevertheless, the crop is small when the acreage is considered, the average yield of wheat per acre in Russia being the lowest of all important wheat-growing countries. In European Russia it varied within the last twenty-three years from 5 to 11 bushels per acre. Nine times out of the twenty-three years it was below 8 bushels. If the Russian peasant obtained as good a yield as the German peasant, the wheat crop of European Russia alone would amount to



From Hulbert's "The Passing of Korea." Copyright, 1906, by Doubleday, Page & Co.

Woman's Correct Street Costume in Korea

1,300,000,000 instead of 400,000,000 bushels.

In the western part of Russia, in the Baltic provinces, Poland, and the southwestern region, the yield is considerably higher—between 15 and 20 bushels per acre; but New Russia and the Lower Volga region, often called the granary of Europe, show a yield normally fluctuating between 8 and 6 bushels and often dropping to 5.

The explanation for such low yields must be sought in Russian agricultural methods as well as the system of land ownership, which dates back to the emancipation of the peasants in 1861, when they were granted small lots out of the estates to which they belonged. The greatest share of the land remained in the hands of the large-estate holders, while three-fourths of the peasants received less than 16 acres per male person, or less than 40 acres per family. At the same time the noblemen's estates were so large that 924 families owned 74,000,000 acres of land. Since the emancipation era the peasants have been largely buying land from the noblemen, having acquired in this way over 50,000,000 acres; but notwithstanding this, the normal increase of population has been such that from 1861 to 1896 the average land holding of the peasants per family decreased 20 per cent.

This system of petty land holdings, combined with the ignorance of the peasants, has caused the survival of very primitive and inefficient agricultural methods. Throughout Russia the peasants get a much smaller yield than the large-estate holders, and the difference is especially great for winter wheat, reaching 3 bushels, or 25 per cent of the yield of the large estates; moreover, the difference is growing larger. In New Russia, for instance, the yield of spring wheat on peasant lands in four out of the last nine years fell below 5 bushels per acre.

The communal ownership of the peasants' lands, which exists in four-fifths of rural Russia, has also interfered materially with agricultural progress by the ever-present danger of redistribution and consequent lack of security of ownership.

There are reasons for these low yields besides the unavoidable climatic conditions. Among these is the insufficient use of fertilizers or manure in the wheat region, due to communal ownership of peasants' lands and to deficient live stock and lack of pasture on the peasants' lands. Thus the number of horses in Russia has not increased during the last twenty years, and from one-third to one-half of the peasants in the various wheat provinces have no horses at all. The implements used are extremely poor and primitive. Even the plows are made mostly of wood, and scarcely scratch the exhausted superficial layers of the soil. The all-iron plow is still a luxury for many peasants. Scythes and sickles are still used extensively for harvesting and flails for thrashing. Seeders are scarcely known. Conditions are somewhat more favorable on the larger holdings of the noblemen; among the peasants the kind of machinery directly depends upon the size of the peasant's lot. Importation of complex agricultural machinery has grown from $2,600,000 in value in 1890 to $14,200,000 in 1903, but it has affected the farming on large estates more than that of the peasants.

Even on the large estates the modern implements are not generally used, since it is often customary to hire the peasant with his live stock and his crude implements. Laborers are hired for $30 to $40 a year in addition to their food, the cost of which does not exceed $25, and a female agricultural laborer receives only $12 to $20 a year. Even at harvest time the average wages of a man with a horse in the wheat belt are only 66 cents per day, of a man alone 34 cents without board, and of a female worker 22 cents. At other times the wages are correspondingly lower.

Nevertheless, the cost of producing wheat in Russia is not as low as one might imagine. Elaborate investigations have shown that because of the low yield

the average cost per bushel of spring wheat in 1899–1903 was 36 cents in Middle Volga, 39 cents in Lower Volga, and 48 cents in New Russia, not including land rent, which has been constantly rising during the last twenty years, because of the intense demand of peasants for more land.

Within twenty years the value of land in the wheat belt has risen from $10 to $30 per acre, and wheat land rents for $3 and $4 an acre, which adds a charge of from 20 to 50 cents per bushel, depending on the yield. With the rent added, the cost of production of wheat rises to 55 to 80 cents per bushel.

The future of wheat production in Russia depends largely upon economic conditions and the educational progress of the Russian peasants. Forty years ago the Russian peasantry was uniformly illiterate. According to the census of 1897, 35 per cent of the adult male peasants were literate, and in the younger generation the proportion of literacy was still higher.

Bread cereals have always been the mainstay of Russian agriculture. They claim over 75 per cent of all cultivated land in Russia, as against 20 per cent in the United States; but forty years ago the share of wheat in Russia was small in comparison with that of rye, the Russian staple. Since the Russian land tiller began to produce for the foreign market, the strong demand for wheat has had its effect. During the last twenty-five years the acreage under rye in European Russia has remained about 65,000,000 acres, while the acreage under wheat has increased from 29,000,000 to 46,000,000. Taking the entire Russian Empire, the acreage under rye has increased from 70,000,000 acres in 1894 to 74,000,000 acres in 1904, while that under wheat has increased from 41,600,000 to 59,200,000 acres.

Of the immense territory of Russia, the wheat belt occupies a comparatively small share. There is very little wheat grown beyond the southern and eastern parts of the famous black-soil region. Eight provinces in the south and southeast contain 70 per cent of the wheat acreage of all Russia, Caucasia has about 12½ per cent, and Siberia 6 per cent.

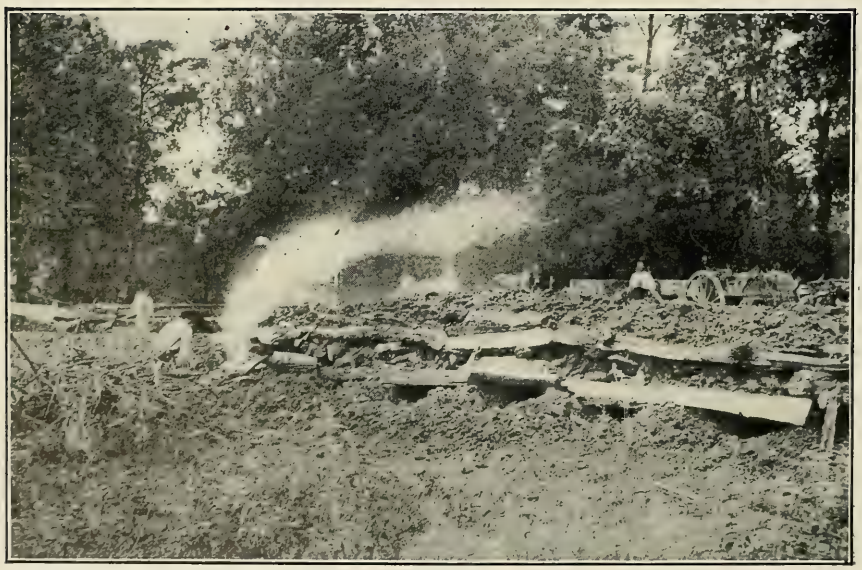
BURNING THE ROADS

CONGRESS some time ago established an Office of Public Roads, which it instructed to conduct experiments and devise methods for improving the roads of the United States. The office has done a great deal to arouse interest throughout the country in the necessity of good roads, and has originated several means of making good roads economically. The latest discovery is that of burning clay roads in Mississippi.

In large areas in the South, particularly in the valleys of the Mississippi and its tributaries, sedimentary clays are found very generally. In these areas there is little or no sand, and the clays are of a particularly plastic and sticky variety. These sticky clays are locally known as "gumbo" and "buckshot." In such localities traffic is absolutely impossible during the wet season, as the wheels of heavy vehicles will sink to the hub.

The clay is black, owing to the high percentage of organic or vegetable matter it contains. It is particularly sticky in its nature and is almost wholly free from sand and grit. After it has been burned, however, the plasticity is entirely destroyed, and a light clinker is formed, which, though not particularly hard, when pulverized forms a smooth surface and seems to wear well. It should be understood that not all of the clay out of

First and Second Courses of Wood Covered with Lump Clay



Pile of Wood and Clay Completed and Firing Begun in One of the Flues

Burning the Roads, Clarksdale Mississippi.—After the road has been ploughed as deep as a four-horse team can drag the plough, the clay is heaped in furrows and then pieces of wood laid across the ridges. Alternate layers of clay and wood are built on this foundation. Photos from Office of Public Roads.

One Section of Road Burned and a Second Section Being Fired

Partial View of Finished Road

Burning the Roads, Clarksdale, Mississippi.—The burned clay, when rolled down and compacted, forms a road surface of from 6 to 8 inches in thickness, If properly burned, the material should be entirely changed in character, and when it is wet it should have no tendency to form mud. Photos from Office of Public Roads.

which the road is to be constructed is to be clinkered, but only a sufficient amount should be rendered non-plastic to neutralize the too sticky character of the native clay. Fortunately the gumbo district is plentifully covered with heavy timber, thus affording an abundance of fuel.

While the only experimental burnt-clay road constructed by the office was in Mississippi, the same methods might be applied with equally good results in the sections of the prairie states that have no other material available for road building.

It is, of course, impossible to give the cost of a burnt-clay road which will apply to the same work in all sections of the country. The items of cost of the experimental road 300 feet long, as constructed at Clarksdale, Mississippi, are as follows:

30½ cords of wood at $1.30 per cord..	$39.65
20 loads of bark, chips, etc.....	6.00
Labor at $1.25 per day and teams at $3 per day	38.30
Total cost of 300 feet.....	83.95
Total cost per mile at this rate...	1,478.40

In view of the success of the experiments so far made and the comparative cheapness of this form of construction, it is hoped that the localities which have no hard material available will continue the experiments with burnt clay. Although it cannot be denied that the gumbo and buckshot clays of the South are particularly adapted for burning on account of the high percentage of organic matter which they contain, it is none the less probable that many of the surface clays and soils of the states farther north could be treated in the same way, and in fact any soil or clay which bricks or clinkers at a comparatively low temperature should be suitable for the work.

Since the experiment made by this office at Clarksdale, Mississippi, numerous sections of burnt-clay road have been built in that locality, and up to the present time only favorable reports regarding them have been received.

THE WORK ON THE ISTHMUS

IN spite of the rainy season, which extends from the end of April to the end of December, steady progress has been made in all branches of the work on the Isthmus during the past three months, or since Congress in June last decided definitely upon the type of canal. Until that decision was reached many lines of work were held in suspense. It was impossible, for example, to fix the location of dumps until it should be known what kind of canal was to be constructed. From the moment the decision was reached the chief engineer set the work in motion along all lines of activity, and the results achieved show very clearly in the statistics which he has since sent to the Commission at Washington in his monthly reports.

The amount of excavation in the Culebra Cut during August was about 245,000 cubic yards, which exceeded by 5,000 cubic yards all previous monthly records. The amount for September was about 289,000 cubic yards, or 50,000 greater than the largest previous record.

There was available at the end of August a total force of 46 steam shovels, of which 27 were at work in the canal prism, 2 outside of the prism, 4 on the Panama Railway, and the rest set up and ready for work in various places.

The double tracking of the Panama Railroad, which is of vital importance to the removal of spoil from the Cut, is going forward steadily. Of the 35 miles of additional track contemplated, about 15 miles have been completed and are ready for use, and about 10 miles more are ready for track laying and ballasting, or about 75 per cent completed.

The receiving and forwarding yards on both sides of the Cut, which are to serve as great clearing houses for trains of spoil from the Cut, are practically completed at Pedro Miguel and Las Cascadas, and the yard at La Boca is about 75 per cent completed.

The great difficulty with labor has been somewhat overcome by slight improvement in the quality of the work of

the Jamaican negro, but it is the conviction of the chief engineer that satisfactory work can never be obtained from this class of laborers. The Commission has advertised for bids on a contract which it has put forth for Chinese laborers, and in response it is understood that several offers have been received, one or two of which may prove to be satisfactory. These are now under consideration, but as there are many questions of large importance involved, including international relations, the contracts, together with the bids, are now under examination by the Law Department of the government and by the State Department.

The Commission has also advertised for bids for doing the work of construction by private contract. Its proposal, in brief, is that the government shall supply all material and retain control of the hospital department, government and police departments, quarters and commissary, construction and maintenance of buildings, and the operation of the Panama Railroad. The contractor is to be paid a percentage of the cost of the work done, and this percentage will be a basis of competition between bidders. In other words, the government would employ the contractor as its agent to do the work, it supplying all the money and materials and he receiving his compensation through a percentage of the money expended. The Commission is confident that it will receive many offers from the leading contractors of this country and abroad to do the work in this manner.

SOUTH AMERICAN IMMIGRATION

MR JOSEPH W. J. LEE, Minister to Ecuador, reports that the government of Ecuador recently signed a contract with an agency in Guayaquil for the purpose of importing immigrants into the lower and eastern portion of the republic. The minister writes:

The company is to be called "The Ecuadorian Immigration Company," and binds itself to import 5,000 families. It is specified in the contract that the immigrants shall be white and preferably of the German or Dutch races. The company is to receive 500,000 hectares of land, but no land which interferes with the construction of the Curaray Railway. All necessities of life shall be entered free of duty, and also all animals, implements, seeds, etc., which the colonists bring with them. The company may sell land in the proportion of 50 hectares to each family. The price shall be adjusted according to the company's expenditures in the delivery of the immigrants. For ten years the government will exact no taxes from the colonists.

The land in question lies low on the eastern slope of the Andes, and transportation therefrom can be accomplished by means of various tributaries which eventually flow into the Amazon. The territory is said to be very rich in rubber and dyewoods, but not particularly healthful for Europeans.

NOTE ON GLACIER DISCOVERY

DETROIT, MICH., *July* 11, 1906.

To the Editor National Geographic Magazine, Washington, D. C.

DEAR SIR: In a recent number (April) of the NATIONAL GEOGRAPHIC MAGAZINE there is a letter by Mr C. A. Taintor, of New York, in which claim is made for original discovery of glaciers on the eastern face of Fremonts Peak. This is based on failure to find that the U. S. Geological Survey, or any one else, had ever visited the locality, save his party.

In Vol. I of the Annual Report of the U. S. Geological Survey for 1878, and on p. XVI of Dr Hayden's introductory letter mention is made of the ascent of the peak by Mr Wilson's triangulation party, and of the existence of these glaciers. The writer was one, among several others, who ascended the mountain at the same time and made a series of negatives showing the entire extent of the glacial field. Mr W. H. Holmes also made a panoramic drawing which accompanied the report.

Yours very truly,

W. H. JACKSON.

THE ORIGIN OF "LABRADOR"

Referring to the meaning of Labrador given in the June number of the NATIONAL GEOGRAPHIC MAGAZINE, I send the following note:

The name *Labrador* was originally given to Greenland by the Cabots, who in 1498 made a voyage from Bristol (England), and in the

course of their sailings came upon the coast of Greenland. Cabot, visiting in Lisbon previous to leaving on this 1498 voyage, met there a certain Joàs Fernandes, llavrador (or land-owner, as we would now translate the word), who had gone in 1492 on a voyage of exploration and had seen land, a description of which he gave to Cabot.

Fernandes returned with Cabot to Bristol and discoursed with its merchants about the land he had seen. On the voyage out he no doubt talked often with the sailors about the land they would surely see. When, therefore, those on board Cabot's vessel saw the land they recognized it at once and cried out, "The Labrador's land," and so it was marked down on the ship's chart.

Later on the whole land from Newfoundland northward was marked Labrador on some maps,* the Straits of Davis, separating Greenland from Ungava, having been deemed to be a gulf and the Straits of Belleisle being then thought a mere indentation of the coast line. When it was found that the coast Cabot called Labrador was really Greenland and was separated entirely from this continent, and, further, that Newfoundland was an island, the mapmakers gave both lands their present designations and confined the name *Labrador* to the central portion, its present bounds.

The above is the derivation given by H. P. Biggar, whose work on the Early Trading Companies of New France evidences the care and consideration which he has given to every point he discusses.

After testing every explanation of the derivation of the word, I came to the conclusion that Biggar's was the correct one, his long residence in Portugal giving him singular opportunities for investigation.

(Dr) GEORGE JOHNSON,
Statistician.

GRAND PRÉ, N. S., *August* 14, 1906.

*Descelier's Mappe Monde (1546) gives the name La Terre du Labourière to Greenland and to the lands to the south, now known as Labrador.

EXECUTIVE ORDER

The official title of the United States Board on Geographic Names is changed to *United States Geographic Board.*

In addition to its present duties, advisory powers are hereby granted to this board concerning the preparation of maps compiled, or to be compiled, in the various bureaus and offices of the government, with a special view to the avoidance of unnecessary duplications of work; and for the unification and improvement of the scales of maps, of the symbols and conventions used upon them, and of the methods of representing relief. Hereafter all such projects as are of importance shall be submitted to this board for advice before being undertaken.

THEODORE ROOSEVELT.

THE WHITE HOUSE, *August* 10, 1906.

At a recent meeting of the Norwegian Geographical Society, in Christiania, the gold medal of the society was awarded to Dr Carl Lumholtz for his scientific explorations in Mexico and Australia.

Panama, The Isthmus and Canal. By C. H. Forbes-Lindsey. Pp. 368. 5 x 7½ inches. Illustrated with two attached maps. Philadelphia: The John C. Winston Co. 1906. $1.00.

The author of "India, Past and Present," "America's Insular Possessions," etc., has given in this volume the story of the great project from the earliest Spanish explorations to the present time. The history of the French Company is told and much information of the De Lesseps régime given. There are interesting chapters on the labor question and the sanitary and health problems, which are the most serious obstacles confronting our engineers today. The lock and sea-level controversy is taken up and plans and estimates of experts given, while many illustrations and several late maps and an appendix, entitled "Great Canals of the World," make the volume a valuable one. J. O. L.

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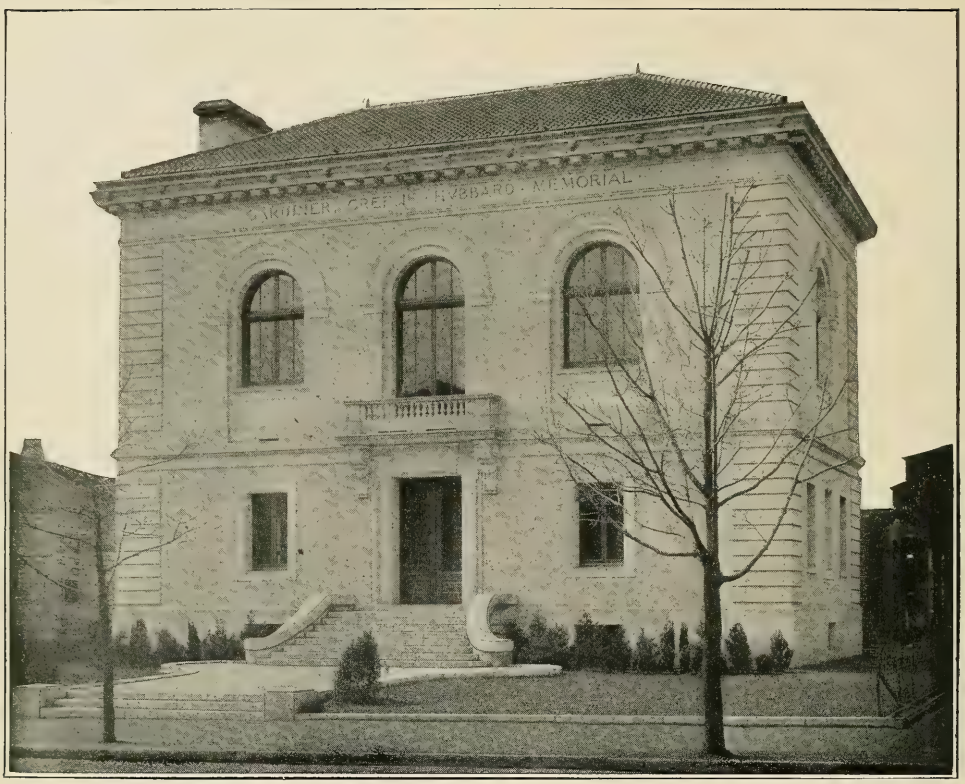

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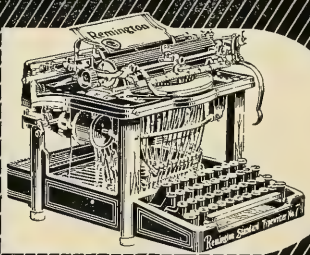

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Vol. XVII, No. 11 WASHINGTON November, 1906

THE NATIONAL GEOGRAPHIC MAGAZINE

THE AMERICAN ECLIPSE EXPEDITION*

By Rear Admiral Colby M. Chester, U.S.N., Retired

Formerly Superintendent of the U. S. Naval Observatory and Commander-in-Chief of the American Eclipse Expedition of 1905

THE American Eclipse Expedition of 1905 was the largest one that was ever fitted out by any nation, and I have had difficulty in gleaning from the mass of scientific data resulting from its work a gist of the matter which in a popular form I shall endeavor to place before you tonight.

In studying the records of parties who had observed eclipses of the sun, it became evident to me that the larger the number of instruments and observers that could be put into the field the better was the chance for procuring results, provided the observers were properly educated for the work. It also appeared that the military training of a man-of-war's crew gave them many of the qualities required for the observers, who were to take advantage of the important few moments during which the sun can be eclipsed, and I endeavored to procure as many men to select from as possible. This assumption was strongly fortified by the experience of Sir Norman Lockyer, the distinguished astrophysicist of England, who has written extensively of his association on eclipse work with the British navy. In the navy men are trained for years to prepare for the one important battle, possibly of a lifetime, which may last but for a few brief moments, and yet the results of which may make or ruin a nation. The importance of training for this event cannot therefore be overestimated.

Likewise an eclipse of the sun can cover but a short period of time, and but few of such events which can be properly observed occur in any one man's professional experience. It is necesary, then, to make thorough preparations if we would get from these rare occasions the full benefits which may be derived from them.

HOW ECLIPSES ARE CAUSED

It is hardly necessary to go into the theory of eclipses with this audience to make clear the operations undertaken by the eclipse expedition of 1905, and without being didactical I will simply explain why we go so far as Spain to observe a total eclipse of the sun.

It is well known that an eclipse of the sun is caused by the moon passing in its orbit between that body and the only known people from whom its view can be shut out. Now the sun is about four hundred times as far away from our inhabited globe as is the moon. By an in-

* An address to the National Geographic Society, March 30, 1906.

teresting coincidence it happens that the sun's diameter is about four hundred times as large as the moon's; so that if these ratios were exact and remained constant, there would be a total eclipse whenever the three bodies were in line with each other; but the moon's orbit being elliptical, it is nearer its primary sometimes than at others, and if near it shuts out more of the sun's light from our visions than when far away. A simple illustration will make this point clear. If one places a coin say one inch from his eye, and looks toward a bright object four hundred times its size, say 400 inches away, the light will just be shut out of view. If the coin be moved away half an inch, some of the light will be seen around the edge of the coin, but if moved nearer it will be cut out entirely and the shadow of the coin will cover the eye. When the moon moving in its orbit is farthest from the earth in the direction of the sun, the light of the sun will not be completely obscured from us and the moon's shadow will not reach the earth. Such a phase is called an annular eclipse because a bright ring is seen around the black disk of the moon. When the moon is nearest the earth, the light of the sun will be cut off completely and a shadow with a maximum width of about 160 miles will form and travel along the earth's surface as the moon moves in its orbit. If it were possible for an observer to be stationed on the moon at this time, he might see the shadow of his own globe depicted as a little dot on the bright side of our earth.

CHOOSING THE POINT OF OBSERVATION

At the time of the eclipse last year the moon's shadow traversed a belt of the earth's surface about 120 miles wide, striking the earth first in British America, moving across Labrador into the Atlantic Ocean, across the Atlantic, thence over Spain in a southeasterly direction, the Mediterranean, Algeria, Tunis, and southern Egypt.

In British America the eclipse began soon after daylight, but the low altitude of the sun at this time of the day tended to lessen the value of such observations as should be made; but, waiving this drawback, the great amount of fog which usually covers the coast of Labrador in summer made it highly probable that the sun would not be seen at all. These considerations led me to eliminate the American Continent from the problem of eclipse stations. As afterward learned, nearly the whole of eastern North America was dominated by a heavy storm of large extent during the whole day of August 30 and no observations were made of the eclipse. Owing to the great importance to science of the eclipse of 1905, astronomers and meteorologists for several preceding years carried on an exhaustive study of the physical characteristics of the countries where the eclipse would be total. In general, Spain offered the greatest inducements to astronomers to observe the eclipse, as there it would take place soon after noon, when the sun was high in the heavens, relieving the observations of a great amount of refraction. Practically all the nations of Europe sent parties thither to observe the eclipse.

Spain has three distinct geographical features, where the meteorological conditions are different: First, the lowlands of the east coast of Spain are affected by the general meteorological conditions of the Mediterranean Sea, which were favorable for good weather during August. Second, the high plateau country of central Spain is usually very dry during August, except that frequent thunderstorms occur in the afternoon. As the eclipse would take place between noon and 2 p. m., the probability of the sky being free from clouds was good. Third, the mountainous region of western Spain being a stormy section itself, the storms passing over from the Atlantic Ocean frequently breaking here, the mountains thus acted as a buffer for eastern sections of the country.

As the maximum duration of totality occurred in Spain and as predictions pointed generally to good weather, it was decided to locate parties there. Moreover,

it was thought that by choosing a site for one eclipse station in the central and another in the eastern section, if bad weather affected the observations of one it might not the other, and out of the two stations we would procure at least one set of observations.

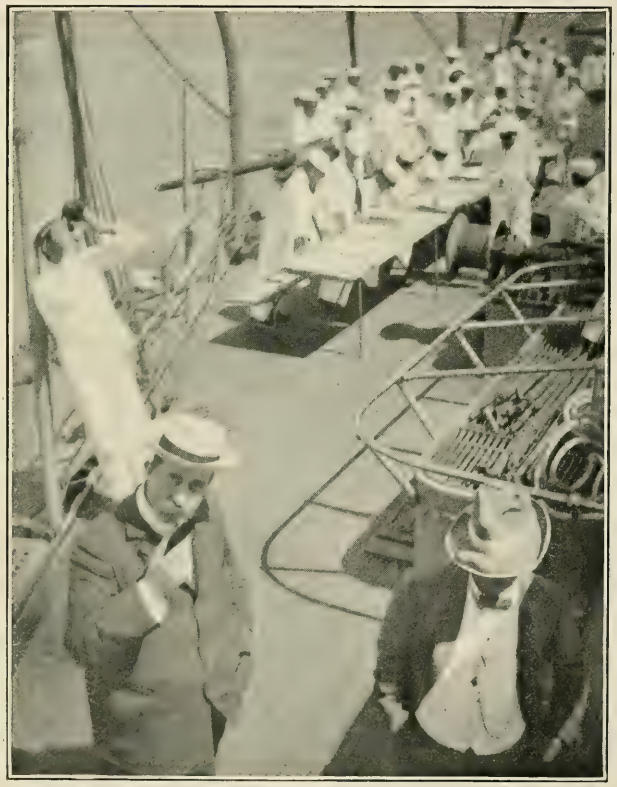
Records indicated that the north coast of Africa was also comparatively free of storms at this time of the year, and as good harbors existed on its coast, affording suitable means for the transshipment of delicate instruments, one station was located in Algeria, at Guelma. This locality was elevated about 1,500 feet above the sea, was far enough back from the Mediterranean to avoid its sometimes foggy conditions, and yet it was easily reached by railroad. The selection of this station was fortunate in many respects.

MONTHS OF PREPARATION

Several months before the expedition started, instruments were prepared and set up at the naval observatory, most of them being newly designed or rebuilt for the occasion. All the apparatus was constructed as perfectly as ingenuity and skill could make it.

In order that during the brief maximum time of 3 minutes and 42 seconds of totality as many photographs of the eclipse phenomena might be taken as possible, the mechanism must be arranged to go without a hitch and the people in charge of instruments made confident by frequent drills that all parts would work smoothly and quickly. Mr W. W. Dinwiddie, one of the assistants, who was well fitted by natural mechanical ability as well as by experience for the work, was put in charge of instrumental construction, and before the expedition sailed all new instruments and practically all that had been used on previous occasions were set up and tested.

A new lens of 7½ inches aperture and 65 feet focal length, composed of three pieces of glass, was purchased for the occasion as well as for future use at the observatory. The two outer lenses are of flint glass, covering a double convex lens of crown glass. The flint glass is of two different varieties, enabling the optician to correct for both the red and blue end of the spectrum. Thus the lens is absolutely achromatic, and both the ordinary or orthochromatic plates can be used with it to equal advantage. This is not the case with the ordinary lens, composed of



Making Sketches During Eclipse

Weather Service Kite

Spanish Boats

Deck of the *Cæsar*

two different pieces of glass, as in that case either the red or blue rays must be left outstanding, the red in the photographic objective and the blue in the visual one. This lens is composed of glass manufactured by Mantois & Cie, of France near Paris. The curves were computed by Dr C. S. Hastings, of the Yale University, and the lens constructed by the John A. Brashear Co., of Allegheny, Pennsylvania. The most important part of this instrument, as in all cameras, is the lens, and this lens alone cost $1,000. The camera is actuated from within the house by a focal plane slit and shutter affording an exposure of less than a thousandth of a second when used in full sunlight, but of course during the eclipse the exposures were much longer.

The illustration shown is the 65-foot photoheliograph, on which a vast amount of thought was expended. It is composed of a long wooden framework ending in a little house. The house is made to be taken apart for transportation, and contains a double door, so that members of the party may enter it without admitting light. Portions of the roof are hinged to allow ventilation and light when desired. The photoheliograph is set up on a horizontal plane, and the light from the sun is reflected into the long box or camera through the lens by means of a cœlostat. The cœlostat is simply a mirror or set of mirrors on a movable polar axis which is actuated by clock-work regulated for solar time, by which the reflected image of the sun, which has apparent motion, is always maintained in the line of collimation of the camera. This instrument is sometimes called Joshua because it makes the sun stand still. Formerly such cameras were set up pointing directly at the sun, the upper end resting upon a scaffold; but while this installation has some advantages, so long an instrument thus mounted is more or less unstable, and the difficulties of protecting it from the wind and in making the adjustments are greatly augmented.

Three new polar axes were constructed, one for each of the three principal observing stations. These were made of iron, which gave a much more rigid support to the delicate photographic cameras and telescopes that were attached to them than was possible with the old wooden machines heretofore relied upon for the purpose. The axes carrying the cameras and other instruments were set up on wooden frames and adjusted parallel to the axis of the earth; hence its name polar axis. The whole apparatus was made to take apart for transportation, and as thus constructed the same instruments could be used many times over.

The polar axes were strong enough to carry photographic cameras, some of which were also made of angle-irons 10 to 15 feet in length. Cœlostats were also used to reflect the image of the sun into other instruments, such as the spectroscopes.

The instruments, having all been set up and adjusted, were taken apart, boxed, and transported to Alexandria, Virginia, where they were shipped on board the *Cæsar* for ports in the Mediterranean.

CROSSING THE OCEAN

The vessels assigned for the Special Service Squadron for the purpose of carrying the experts and furnishing the men who were to assist them in observing the eclipse were the *U. S. S. Minneapolis,* Captain J. M. Miller, U. S. N., commanding (which vessel was the flagship of the commander-in-chief); the *U. S. S. Dixie,* Commander G. A. Merriam, U. S. N., commanding; and the *U. S.* collier *Cæsar,* Lieutenant Commander G. H. Stafford, U. S. N., commanding.

The *Cæsar* left Alexandria on June 18 and Norfolk on June 22 for Gibraltar, and the *Dixie* left Philadelphia June 26, 1905.

Incidental to but connected with the eclipse problem, is the important study of meteorology. Prof. F. H. Bigelow, of the Weather Bureau, was invited to go

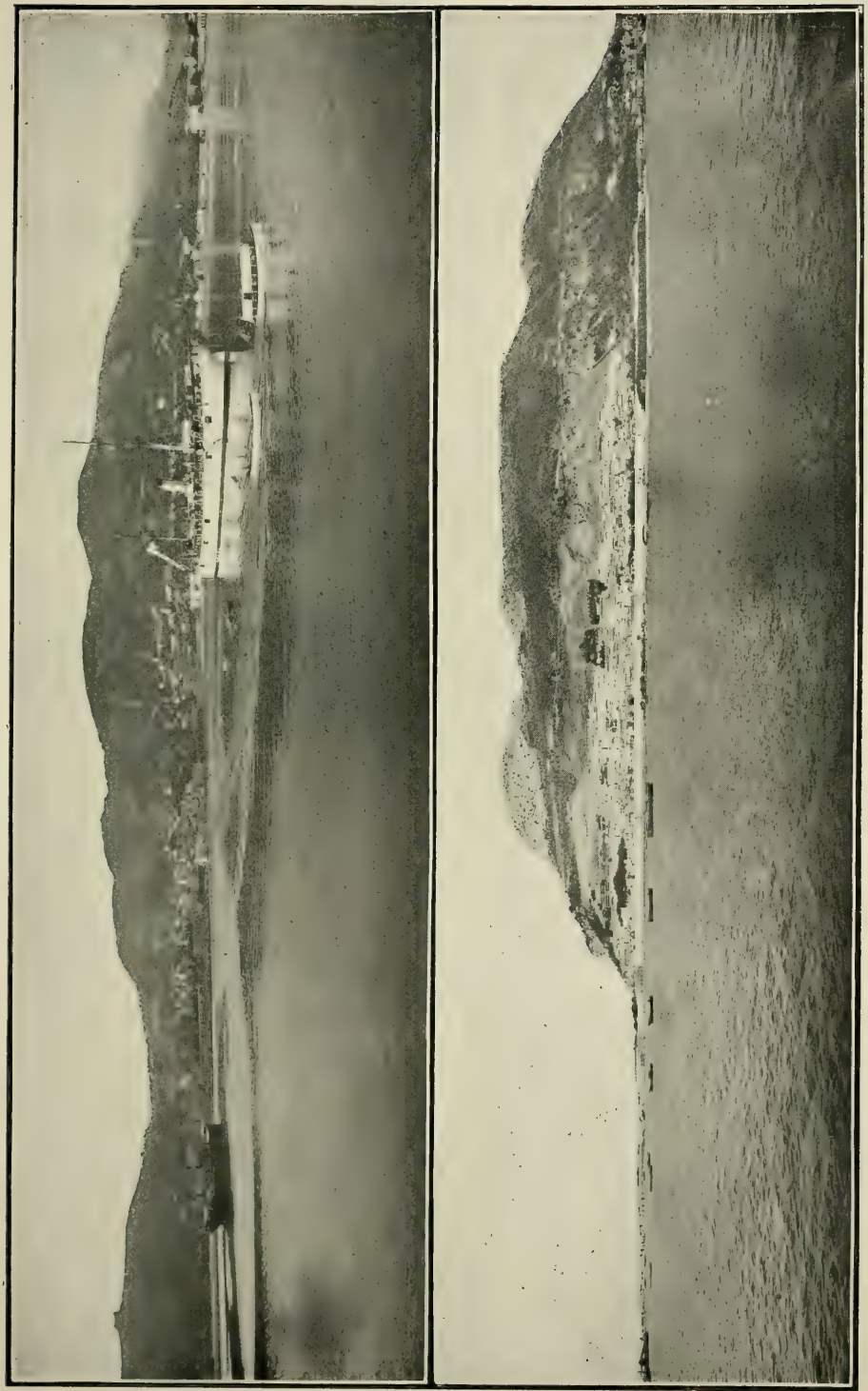
on the expedition and take charge of this work, and Professor Moore, the Chief of the Weather Bureau, kindly detailed him for this duty, thus relieving me of all care of this important matter except, as we say in the navy, "to pay out rope," which means to give a free hand and plenty of assistance.

An important part of meteorology is a study of the upper strata of the atmosphere lying over the ocean, and in order to make observations in this out-of-the-way field for research Professor Bigelow took passage on board the *Cæsar,* and by means of kites carried on a series of meteorological observations which extended through a period lasting until his return to the United States in October. The *Cæsar,* with her large and spacious decks fitted with numerous steam winches, gave efficient means for flying these kites and reeling in the wire lines which made them captive. Once a mishap occurred, making it necessary to drop a boat and regain the water-borne kite before it should sink with its delicate instruments or before they should be destroyed by hauling through the water. The boat, once returned to the ship, must then be hoisted with care, possibly with difficulty, owing to the ocean swell, in order that the instruments should not be disarranged.

DRILLING THE SAILORS

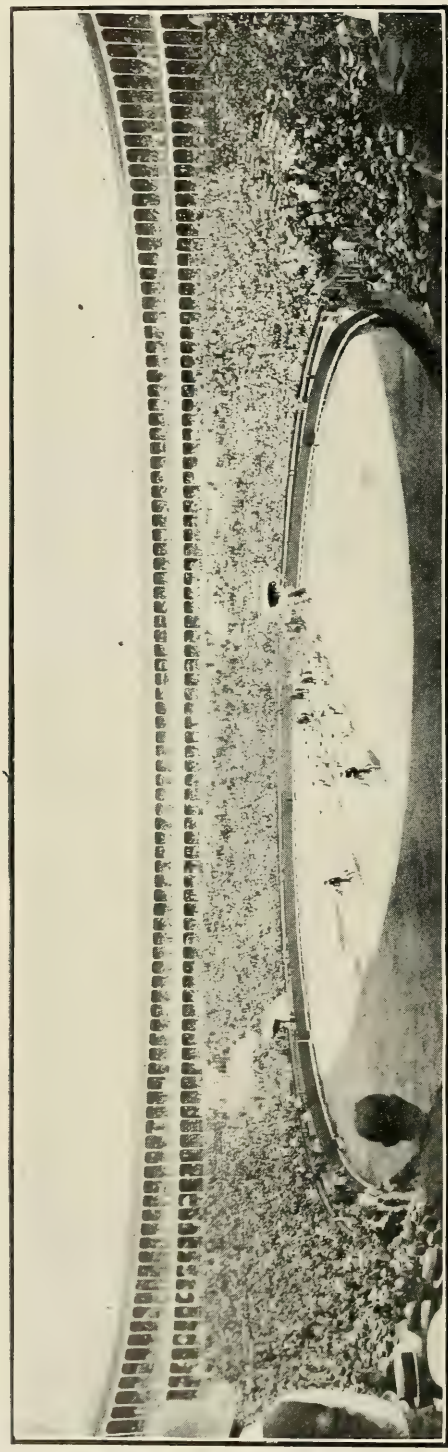
The *Minneapolis* left the United States on July 3, 1905, with the last of the expeditionary force on board, bound for Gibraltar, whither both the *Dixie* and the *Cæsar* had preceded her. En route across the Atlantic frequent lectures were given to the crew of the ships by the experts on board, to prepare the men for the work in which they were to take part, and these lectures were listened to with marked interest by all. It was not found necessary to call for volunteers for the service to be performed, for every one showed his eagerness to take part in observing the eclipse. The instruments and objects of making the observations were explained by means of lantern slides, and there were also shown pictures of the countries about to be visited, giving the probable conditions likely to be met with. Classes were formed from the officers and crew to make both plain and colored drawings of the corona as well as for the study of other parts of the work. The classes were drilled in the use of color charts, which were taken along to compare the colors actually observed in the eclipse phenomena. The colors on the chart marked by numbers gave a ready and quick method for use in preparing colored drawings. For this purpose the coronal field was laid out in sections. Observers were assigned to each section, and the color of the corona as seen by them was separately recorded on the chart to the nearest shade noted. The color of the different parts of the corona was then established by majority vote of the three observers as recorded. In this way colored maps of the corona and protuberances of the sun have been compounded, one of which is published with this article.

One of the requisites in selecting members of the crews for service with the eclipse parties was that they should be first-class conduct men—that is, they must be exceptionally well behaved at all times, whether afloat or ashore. This matter was very important, for with the late Spanish-American trouble still fresh in the minds of the many into whose society we were about to enter, any act of bad conduct or discourtesy on the part of any of our people was likely to produce a result disastrous to the entire expedition. It is pleasing to state that while every member of the crews of the ships visiting Spain landed on its shores, many of them to remain for several weeks, there was not a single man who did not comport himself as a gentleman. I would like to state here with reference to the men of the navy, that when called upon for extraordinary good conduct as well as for extraordinary heroism, they may be expected to meet the issue with a full sense of their obligation to the country. A noteworthy instance of this kind de-

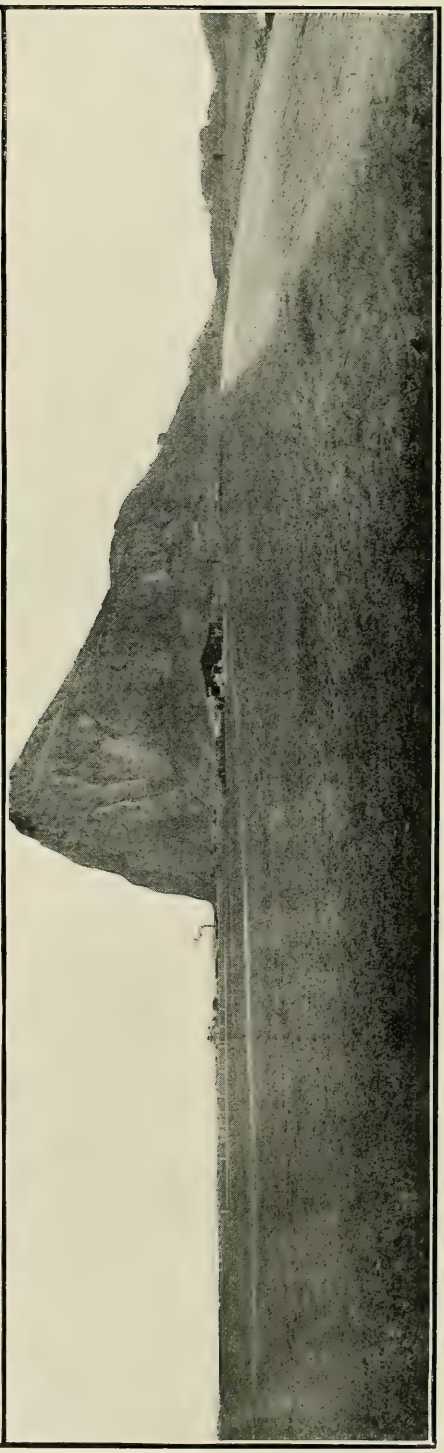


U. S. S. Dixie

Gibraltar



A Spanish Bull Fight



The Rock of Gibraltar

veloped during the Spanish-American war. On all ships of the navy there is held by the captain what are called police courts, to investigate and punish for minor infractions of the regulations, that the discipline which is characteristic of the service may be maintained. But the moment war was declared I think on almost every ship in the navy the bad men became good, the lazy zealous, and the careless attentive; so that practically the police court was put out of business. The desire, therefore, to take part in observing the solar eclipse became an incentive to good conduct on the part of the crews of the ships and acted for the betterment of the discipline of the command.

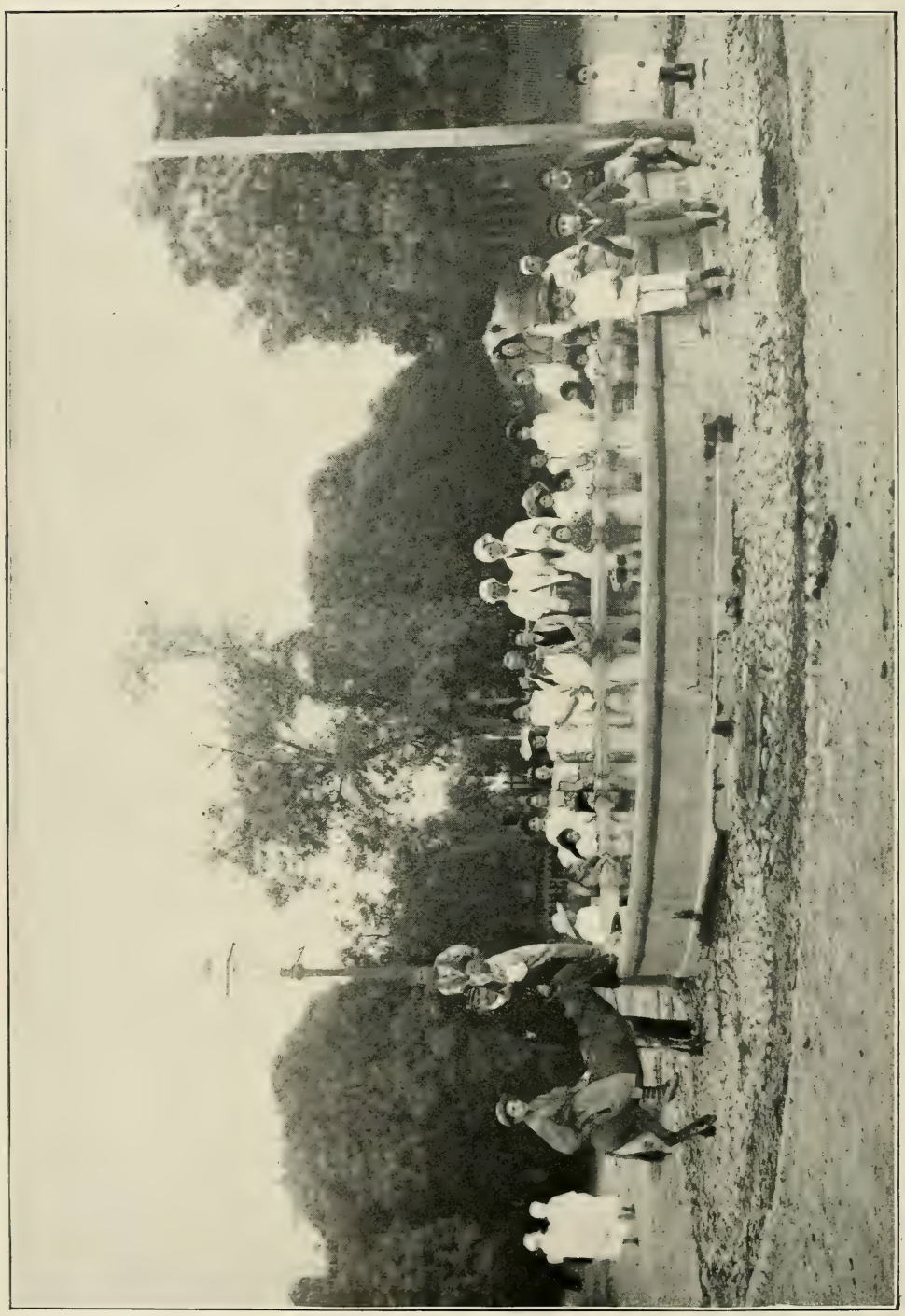
After a short but pleasant and profitable voyage, the shores of Spain were sighted from the *Minneapolis* on the 14th of July, and, steaming near Cape Trafalgar, where Nelson not only won a peerage but a tomb in Westminster Abbey as well, we passed the port of Tarifa, the most southern town of Europe and the most thoroughly Moorish in Andalusia. The ancient importation practices of this town gave a name to a principle about which the people of the United States in political parties assembled have fought many a campaign. That the party which had as its motto "Tariff for revenue only" would have had the sympathy of the ancient Arabs who controlled the destinies of Tarifa is unquestionable.

THE ROCK OF GIBRALTAR

Upon entering the Straits of Gibraltar on a bright moonlight night, the *Minneapolis* was put in communication with the *Dixie* at Gibraltar by wireless telegraph, and Captain Merriam assured us of a hearty welcome by our British friends, who hold this celebrated stronghold with a tenacity of purpose that is characteristic of the nation. The bay, as you know, is noted for its beauty. The low land on the north and west slopes gradually back to the mountains, with here and there an elevation of moderate height, which covered by the green fields of Andalusia is a typical formation of nearly all the Mediterranean coast of Spain. In one of the pretty niches between the bluffs is located the town of Algeciras, where sat a congress of nations to decide the destinies of Morocco. We trust if it has no other result it will break up such acts of brigandage in that country as were recently so well described in this hall by one of its victims, Mr Perdicaris.

On the east of the beautiful bay lies the celebrated Rock of Gibraltar, which is too well known to need description here. You may not all know, however, that at its foot England has built, at an enormous cost, a land-locked harbor, which is reached through two narrow entrances, that seems as substantial as the rock itself and as strong as the "sea power" that Mahan has shown is wielded by the owners with the force of a giant. In this harbor there is generally present a fleet of battleships, of nearly equal size to the combined fleets of almost any single nation of the globe, that is at all times ready for action. This fleet is in constant touch with the home office in London, ready to be dispatched, at the touch of a button, to any point where British interests may be put in question. While we were accepting from the large concourse of officers here assembled the hospitalities of the port, a portion of the British Atlantic fleet which here makes its headquarters was receiving in our American ports an ovation that has bound still closer the ties of friendship existing between the two nations.

Entering the beautiful Bay of Gibraltar in the early morning, the ship makes her bow to the English nation in a twenty-one-gun salute, which reverberates over the waters and partially hides our pretty ship from view. The salute is returned in kind by guns from the wonderful casemates of the "Mount," as it is called, which wreathes the hills in smoke, adding to the picturesqueness of the scene. Once at anchor, a boat is seen approaching, whose narrow pennant flying at the bow indicates that a commanding officer of one of the ships is about to visit the flag-



Public Fountain, Guelma, Algeria

ship, and preparations are made to receive the officer with the honors of his rank. This is always an important event in the life of naval men after a long trip at sea. The first boat usually brings the mail-bag, which is watched by many an eager eye as it is passed over the side of the ship, to bring good tidings for the many, but possibly it will bring an alarming message for some poor soul, whose thoughts during the long passage he has made have been seldom away from the bedside of some loved one whom he was forced to leave behind with anxiety and sorrow. Let us hope the bright sunlight of the day portends good news for all.

As the scattered threads of our plans are gathered together here at Gibraltar from our reconnoitering parties, sent out in advance of our arrival, and from our diplomatic agents abroad, the members of the three parties about to take the eclipse field are assigned to their respective stations, and a final consultation with the officers of the African party is held over a dinner on board the *Minneapolis* preparatory to their early start the next morning. This party takes its departure on board the U. S. S. *Dixie* July 18 for Bona, Algeria, and three days later the cable announces their arrival at this interesting port.

BONA, ALGERIA

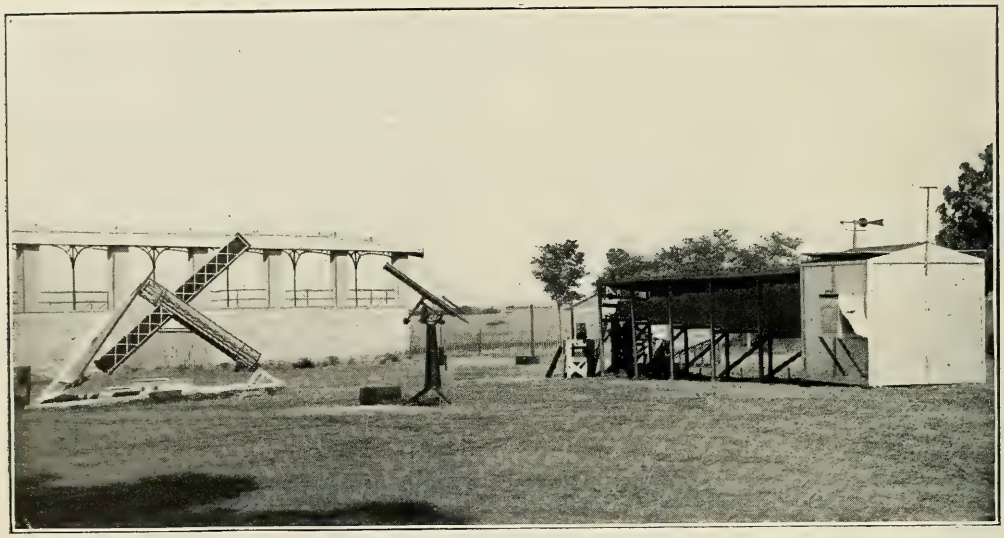
The harbor of Bona is a large basin formed by a break-water built out into the Mediterranean, rivaling in size that at Algiers. The shipment of a vast export trade from the interior of Algeria is here carried on in connection with a railroad leading from Constantine to the city of Bona. The trade of Bona has increased enormously within a few years, so rapidly in fact that I have found but few Americans who know of the large and imposing city which has sprung up like one of our prairie towns. Through the kind efforts of the American consul, the arrival of the *Dixie* was anticipated, and as the general site for the African station had already been selected at Guelma, Captain John A. Norris, U. S. N., the officer in charge of this station, soon had his party en route to that point over the railroad just mentioned. Here were seen the ruins of an ancient theater of the once famous nearby city of Hippo Regius, the favorite residence of the Numidian kings and the central station of commerce and civilization in North Africa. Other remains still exist here, giving archæologists a field for research of which advantage is being taken.

THE STATION AT GUELMA, ALGERIA

Captain Norris and his party were received at Guelma with marked kindness by the mayor of that pretty little city, who placed at their disposal a site for an eclipse station such as is rarely to be found. The mid-summer weather made horse-racing impractical at the time our party was there, and the park in which the track was located was selected for our camp, and its free use was given to this the first eclipse party that had arrived in the country. The grounds were naturally shut off from the public and its policing became a matter easily regulated. All persons not connected with the expedition were excluded from the premises, but a fine large grandstand attached to the grounds gave them an opportunity to witness the eclipse phenomena without interfering with the operations of the party.

Captain Norris, who had direct charge of the transit work, soon had his instrument mounted and under cover ready to observe the latitude of the station, on which the adjustments for the other instruments depended. His long experience in building up the chain of longitude stations, covering the entire globe, in which American officers have bound the countries of the world together by telegraphic observations from Greenwich and Washington—a scheme that was inaugurated by the late Captain F. M. Green, U. S. N.—well equipped him for this important part of the work.

One of the polar axes was soon in place and adjusted to the exact latitude and longitude of the station, which had



Eclipse Instruments, Guelma

first been established, the former element by the transit instrument and the longitude by telegraphic comparisons of time from the fine observatory at Algiers.

Then the photographic dark-room, that prerequisite of every eclipse station, was assembled and put together for immediate use in the development of photographs used in testing the instruments.

Naturally the long forty-foot photoheliograph camera required considerable time to put in place, for besides its installation it had to be covered by screens to protect it from the rain, sunshine, and strong winds.

An equatorially mounted telescope, to be used by the director general of the camp, was mounted in a central position, which commanded a view of all the instruments under his control.

During the time the instrumental installation was going on, one of the party strayed away from the camp and fell into the hands of the Arabs of this desert country, but it is apparent he was not treated as inhumanely as those other brigands in Morocco treated our friend Mr Perdicaris. One of the junior members of this Arab party went so far as to pat our sailor man on the cheek.

Probably the next most important instrument we have in the party is the grating spectrograph, under the charge of Mr Jewell, of Johns Hopkins University. It is difficult to conceive of the thought and labor that has been expended upon this instrument. An introduction of a prism in the line of the sun's rays passing through a lens to the photographic plate is easily accomplished, but the fitting of a grating which will give probably better results is quite another affair. It is doubtful if there be a piece of machinery so carefully constructed as an engine which cuts 20,000 lines to the inch on a piece of metal which is necessary for this delicate work. This must be done to make a diffraction grating.

Now we come to a picture of the artists who are to draw the corona and its extensions, some of them being provided with telescopes to extend their view of the coronal streamers to the outer limits of vision. Finally is seen the whole party assembled around their completed instruments, with the tall form of Captain Norris, the chief of the party, on the left.

OUR RECEPTION IN SPAIN

Having seen the African party ready

for work, let us return to the two ships that were left at Gibraltar to prepare for the campaign in Spain.

From Gibraltar the *Cæsar* precedes the *Minneapolis* to the port of Valencia, Spain, and announces to the flagship by signal when that vessel reaches the approaches to the harbor that cordial greetings had been extended by the Spanish authorities upon her arrival. The *Cæsar* not being a saluting ship, it became the duty of the *Minneapolis* to fire the first national salute to the Spanish flag that had been given, I believe, in a Spanish port since 1898. This was also probably the first salute that was ever given by an American man-of-war in the Grao de Valencia.

The recital of the facts of this first visit of an United States war vessel to Spain since the Spanish-American war seems rather tame, but the visit was attended with momentous possibilities that might wreck plans that had taken many months to get into shape, and the manner of our reception therefore was most important to us.

It is seldom that one enters the confines of Spanish territory and does not find in progress some sort of entertainment for its pleasure-loving inhabitants, and this occasion was no exception to the rule. A ten days' fiesta had just begun, and soon we were drawn into crowds of men, women, and children, all bound for a good time and as indifferent to every other care as if all business had ceased for them forever.

The *Minneapolis,* after having been made to shine like a new pin, was thrown open to visitors, and as this was about the only place of interest in Valencia for which there was no admittance fee, advantage was taken of the concession, not usually given by their own men-of-war, and thousands visited the ship almost daily during the entire stay in port. The ship was secured to the quays which mark the limits of the port and form a promenade, and our fine band gave to the many people usually found there a free concert morning and evening, a treat that was apparently appreciated by all.

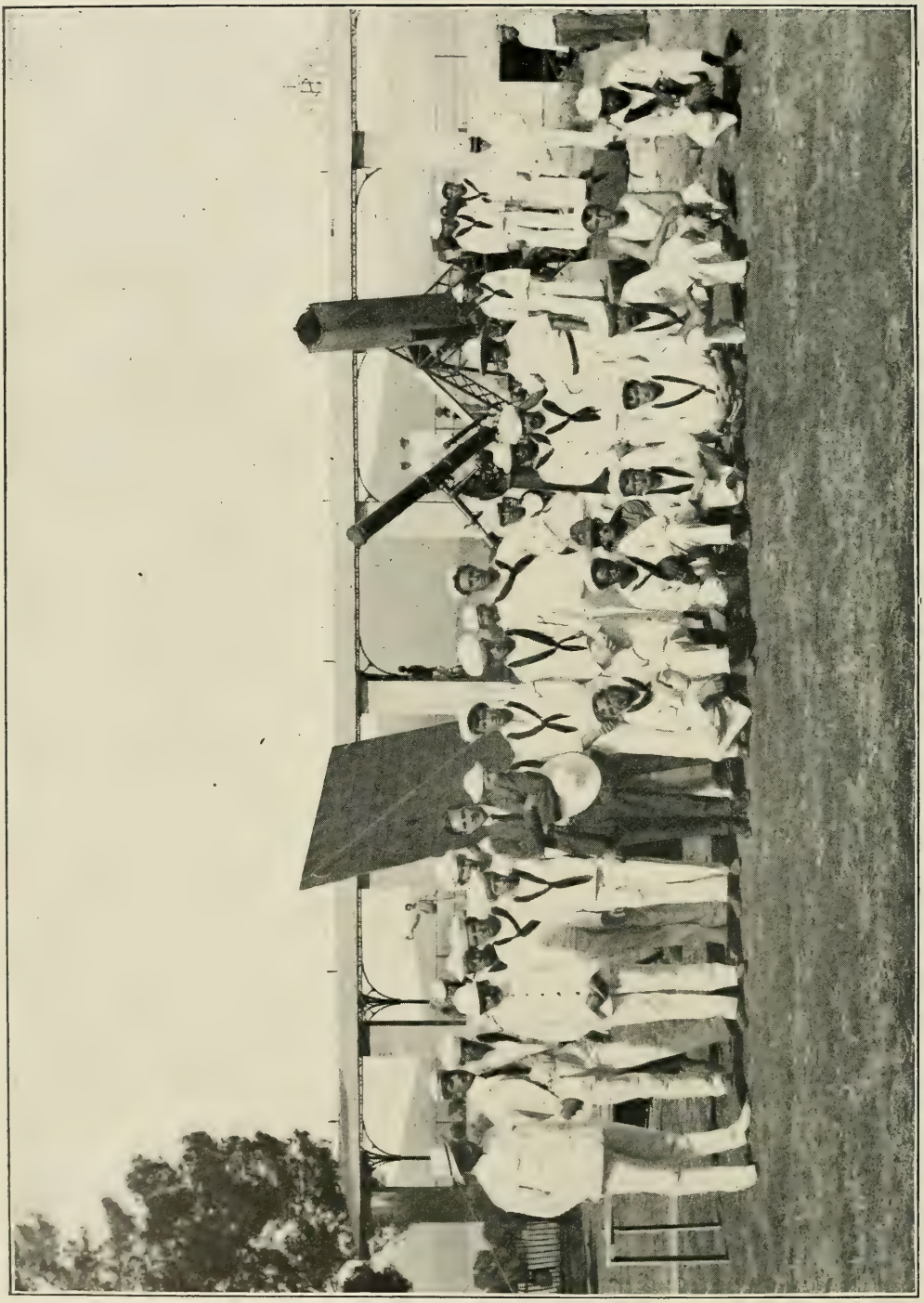
One of the features of the fiesta was a boat race, which took place in the harbor, and we were early invited to take part in it; but I must admit that the honors on this occasion were something like those of the boy who stood next to the head of his class of two members. The only two boats which entered for the regatta prize were from the *Minneapolis* and the *Cæsar,* the trophy going to the winning scrub crew, which had never pulled together before, owing to a fluke which brought misfortune to the other. Still the squadron brought back to our country a portion of that $20,000,000 which went to pay for the Philippine Islands.

Of course no saint's day or week could be properly celebrated in Spain without a bull fight, and we were all invited to witness the one that took place soon after our arrival. Some of us escaped this ordeal, however, owing to a misunderstanding which happily removed the event from an official basis. I wish to say here that not all people in Spain go to bull fights, and two officials whom I asked if they intended to witness the scene replied in rather resenting tones that they never went to such entertainments.

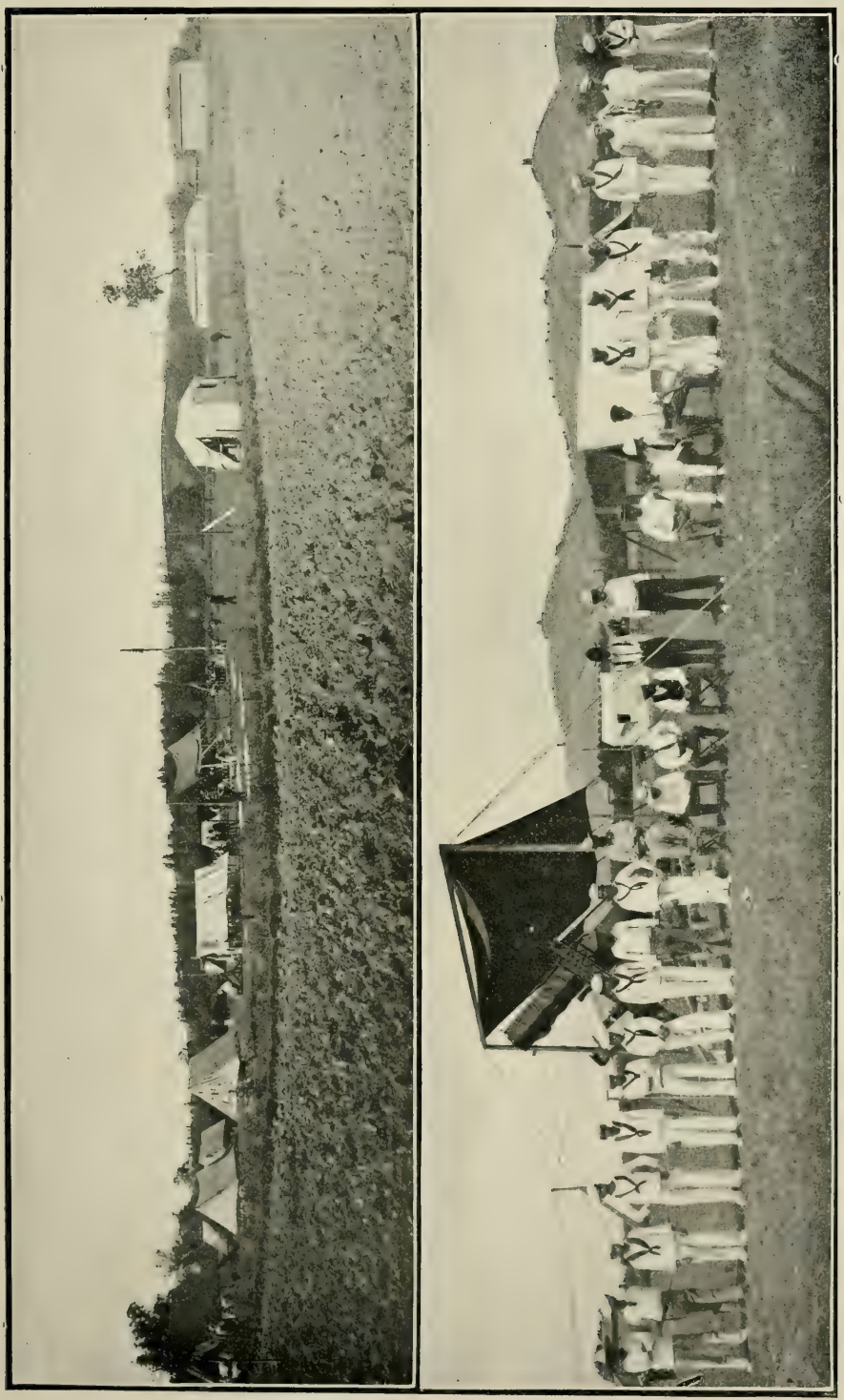
THE STATION AT DAROCA, SPAIN

But we had work to do, and after a reconnoitering party consisting of Lieutenant Commander Hayden, Professor Littell, and Mr. Peters had scoured the country, passing through miles of vineyards, where a native wine is produced and sold at a few cents a gallon, a spot is found on which to locate one of our camps. Arrangements were then made to establish stations, one about 12 miles from Valencia, at Porta Coeli, and the other at Daroca, on the highlands of the interior. The Daroca party and implements were transported by train along the coast to the old fortified town of Sagunta, where the road turns inland over the hills to the city of Calatayud, passing by the anciently walled city of Daroca.

Historically, Sagunto is one of the most interesting cities in Spain, and the high hills on which it is located clearly

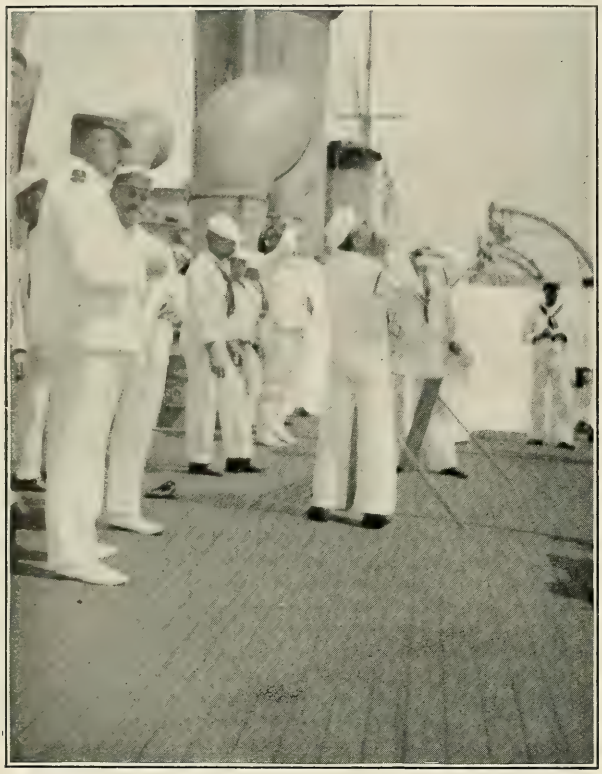


Eclipse Party at Guelma



Camp at Daroca

Eclipse Party at Daroca, Spain



Deck of the *Minneapolis* During Eclipse

show why Hannibal during his conquering march to the Roman capital had to wait so long to procure its surrender, which he did under a promise to spare the lives of its inhabitants, but which promise he kept by killing every one of them.

Under the kindly concessions of the railroad company, our party disembarked personnel and material at Daroca by July 29. With nearly every inch of available land in Spain under cultivation, it is no easy matter to find a location for an eclipse camp. The blowing sands from the alkali plains of the highlands would ruin the instruments in no time, and a large grass field was about the only suitable place which would answer the requirements. Fortunately the use of the only grass plot in the whole region around Daroca was kindly offered Professor Eichelberger, the chief of the party, for a small rental. Here the instruments and camp were set up. The polar axis was soon in place and covered by an awning to shield it from the wind and sun.

THE PROGRAM FOR THE SHIPS

Having seen this camp completed, the instruments installed, and the party assembled, let me refer you to the program for the ships.

Notwithstanding the concessions made by the railroad companies in Spain to the eclipse expedition, it was found that the expenses of transportation were such a drain on our resources that I decided to retain the draftsman detailed for the Daroca party with those who were to remain on board the *Minneapolis*. The ship accordingly had a double force with which to make drawings of the eclipse phenomena, and thus equipped Captain Miller was ordered to take station with his vessel on the center line of totality, about a mile from the east coast of Spain. Here the artists had a fine view of the landscape, reaching over the coast line and far into the mountains.

Astronomers have tried in vain to photograph the moon's shadow as it sweeps over the land at the moment of totality, and it was thought that even did we not procure a photograph of this desirable feature of the eclipse, a good description of it might be made by our large force of observers.

For the purpose of photographing the shadow bands, the ship's deck was covered with white sheeting and screens of the same colored cloth were erected perpendicular thereto. It was hoped to catch with the camera the lights and shades

"The Gates of Heaven"—Porta Coeli, Spain

pictured on their surface; but, as in photographing lightning flashes, this was found to be a difficult undertaking.

The *Minneapolis* party were, however, paid for their efforts to obtain this desirable result by getting with their field of observation, which covered both the sea and the land, one of the most entrancing views of the eclipse phenomena that was ever presented. The officers and men of the *Minneapolis* were early at their stations and 300 eager pairs of eyes were ready to take advantage of the brief time of totality.

During the first phase of the eclipse—that is, from the time the two disks came together until totality began—the crew of the ship amused themselves chasing the little crescent shadows of the partially eclipsed sun over the decks. These shadows were formed by the light shining through pin-holes in a sheet of paper.

Here are seen the corps of draftsmen ready for work, and the genial face of the Honorable Charles A. Bryan, minister to Portugal, who has come all the way from Lisbon to witness the scene. He is welcomed, as everywhere else, by a host of friends. He takes special charge of the fowls, to see if they perform, as predicted, at the proper moment. The rooster being a little slow to begin his part when the sun shines forth after its eclipse, the ambassador's own voice may be heard as a substitute.

The King of Spain took much interest in the visit of astronomers to Spain to view the eclipse, and on the day it took place he was stationed at Burgos, where most of the European astronomers were assembled. He was only partially rewarded for the long trip to that interesting city by obtaining a dim glimpse of the eclipsed sun as it occasionally appeared through the dense clouds which

swept across the sky, seeing nothing of the corona itself.

PORTA COELI—"THE GATES OF HEAVEN"

Having seen every other party settled, I would like to take you back to the headquarters of the expedition at beautiful Porta Coeli, or, in plain English, "The Gates of Heaven."

Spanish Mendicant

Surely upon the perfect summer day upon which we arrived at Porta Coeli this name seemed most appropriate. A group of green hills with verdant valleys between; here and there the tall smokestacks of the vineyards near by, cutting the skyline like pins in a mat; and topping one of the hills an ancient and picturesque monastery looked down upon a beautiful valley that wended its way to the sea. The monastery was once the retreat of the Carthusian monks, but is now the property of Don Francisco Carbajosa, who has preserved intact as far as he could the wonderful chapel itself. A former owner had despoiled the chapel of some of its adornments to grace cathedrals at Madrid and elsewhere, but in the main it is as the ancient monks left it. Like other old Spanish ruins of a once religious character, it also has its legends. One of these in particular is most interesting. It tells of a Carthusian monk who loved not wisely but too well, and was doomed for his sin to life imprisonment within the circumscribed limits of a narrow cell. The only window in this cell, a small one, opened upon the chapel, through which he could hear the daily mass, but the beautiful view into the Gates of Heaven and all other communi-

cation with the outside world were cut off. This and minor legends give the place the flavor of its romance. Here in this ancient monastery hospitality was generously dispensed by the owner to all members of the party, to whom he loved to show the beauties of the chapel. My one night under its roof before the dawn of the eventful day which was to make or

the place that had been built many centuries before; but, as there was no chaplain present with the party until the day of the eclipse, our people seemed to have no use for it. The Sundays were usually spent, after a week of hard work, in roaming the fields, the result of such expeditions being shown in many kodak films.

Spanish School

break all our plans was most gratefully appreciated.

Senor Carbajosa placed his whole plantation at our disposal, and as a part of the buildings had once been turned into a summer hotel, the isolation of our station was not so marked as it would have been but for the presence of its visitors.

There was also an ancient church on

With all needed concessions granted for use of the camp, the advance guard of the party for No. 2 station reaches the spot over a rather rough road from Betera, a distance of 7 miles, in a coach the movements of which were such an aid to digestion as would give an appetite even to one of the eclipse instruments.

Then the equipage for the station next came lumbering along behind carts

drawn by mules with drivers who had no conception of time, and who between the lashing of their teams to keep them moving at all and an occasional stop to pick the grapes that lined the road, sang with the contentment of their race.

And now the party is at its destination, the men with their hammocks and camp outfit to spend weeks in such an outing that but few of them will forget.

The building construction soon begins, and the dark room is put up for the large new 65-foot photoheliograph fitted with the thousand-dollar lens from which we expect valuable results in photographing the corona if all goes well.

Also the cœlostat is set in place with its two mirrors, the one to reflect the sun rays to its lens of the photoheliograph and the other to throw light into the spectrograph. It may be stated in passing that the principal object of locating the large photoheliograph of 65 feet of focal length, which will produce a picture of 7½ inches in diameter, here is to make observations of the inner corona, and for this purpose a station is selected only 10 miles inside the edge of the moon's shadow. Thus we compromise between Daroca, where we have 3 minutes and 42 seconds of totality, and a station on the edge of totality, where the period is but an instant.

Of course we cannot take as many photographs here, where the eclipse lasts only 1 minute and 46 seconds, as at Daroca; but, as the lower edge of the moon's disk barely covers that of the sun, we can better observe the protuberances and corona near the polar region. A 7½-inch photograph may not seem colossal in size, but when you realize that it is about 200 times as large as a picture of the sun taken with an ordinary kodak, its size may be appreciated.

And now visitors come to camp, and a native of Porto Rico, the one sailor who is at home with the Spanish language, sits at the feet of the senoritas; but before the party finally leaves the place he becomes so popular that they are willing to sit at his feet—notwithstanding by this time a number of men had also become more or less proficient with the language, under the teachings of the young ladies, so that Garrion has rivals in their affections.

A frequent and interested visitor comes to camp. He is said to be the wealthiest man living in the vicinity. The troubadors also put in an appearance and play the Spanish fandango for the benefit of the eclipse party.

Another picture shows our native guard, the mountain rangers.

A charming young lady, who is about to become an American citizen by marrying a gentleman from Porto Rico, visits our officers and captivates them as she has her fiancé.

The last contingent from the *Minneapolis* reaches the station on August 28, under charge of Lieutenant Commander Hayden. With the party now augmented to nearly 60 members, he took charge of the drills and prepared them for the eventful occasion to come later.

CORDIAL COÖPERATION BY THE SPANISH AUTHORITIES

The three principal stations of the American party for observing the eclipse were prepared for the eventful 30th of August with the greatest care, and the instruments adjusted to the exact location of the point occupied with refined accuracy. The determination of latitude was easy, but as the stations selected were necessarily well away from centers of activity, the proper means for determining longitude were wanting. Here the government officials in Spain and the telegraph companies in Algeria came to our rescue and not only extended the telegraph lines to our camps, but detailed operators to assist us in the work. We were thus connected at Guelma with the fine astronomical observatory at Algiers, and the Daroca and Porta Coeli stations were given, at stated intervals, the tick of the clock of the Royal Observatory at Madrid. The extension line from Valencia to Porta Coeli alone was nearly 18 miles in length and was put up at very con-

Visitors at Porta Coeli

siderable expense to the Spanish government.

This was only one of the many features of the eclipse expedition for which we were under obligations to the Spanish authorities. I desire to place on record here that so cordial was our reception from the alcalde of Segorbe as to include the offer of the principal park of the city for a camp ground and a good portion of its municipal buildings for the use of one of the parties, but its location was about 20 miles within the eclipse belt, and Porta Coeli, 10 miles nearer the edge, was selected for station 2.

OUR ANXIETY IN THE MORNING

The morning of August the 30th dawned with gloom in the air as well as in the minds of many an anxious astronomer in Spain; great masses of black clouds chased each other across the heavens, as if bent on shutting out from the view of man the grand performance of nature about to be enacted; but toward noon it began to clear at our Porta Coeli station. There were, however, signs of a return of the clouds that kept us between hope and fear for several hours. The Daroca station telegraphed about two hours before the eclipse, "Cloudy but clearing." Our anxiety simply became intensified by this brief message. If it would clear at one station in time to make observations, the strain on our overwrought nerves would be compensated for; otherwise the labor of years would be thrown away and I fear the chief of the expedition would be the victim of the "fool's errand."

For six weeks preceding the eclipse a drought had covered the land and the sky had been cloudless, but the want of rain left the air full of impurities, and its motion, being magnified in our instruments, gave an indistinct picture in our

The Three Guardsmen
Spanish-American Complications

Interested Visitor
Spanish-American Alliance

cameras that caused alarm. The storm then sweeping over Spain, however, cleared away all the imperfections and caused a distinctiveness to our photographs rarely seen during an eclipse. Clouds still surrounded us, however, drifting with great rapidity, and we watched with keen interest to see if they were steering toward our objective; but the miss which they made was as good as many miles to us. We afterward learned that at Betera, only six miles from Porta Coeli, the sun was obscured by clouds all during the time of totality. It was then a source of congratulation that the station had been selected at an elevation of some 1,000 feet, which, while increasing the difficulty of transportation, gave us a better view of the eclipse than could be had on the lowlands near the Mediterranean shores.

THE ECLIPSE

Soon after noon the sun sent out her glorious rays down into the "gates of heaven" on as fair a view as can be imagined. Mr Hill, assistant astronomer, in charge of the 9-foot camera, called my attention to the picture of the sun on his ground-glass plate. "As clear as a bell," said he—not a quiver in the atmosphere.

As the time drew near for the first contact, all eyes became riveted on the sun. Suddenly Mr Hill sang out, "Here he comes." It was twenty seconds ahead of the time predicted, but why we did not stop to consider. At first only through the delicate instruments could we discern the contact of the sun and moon and no appreciable effect was observed on the landscape, but as the opaque body of the moon gradually covered the bright disk of the sun, the many thousands of interested observers became conscious of the growing darkness. We were then watching the partial phase of the eclipse, which might be seen by almost any of the 2,000,000,000 of the earth's inhabitants who were favored with daylight and good weather; but the comparatively few in number who were located within the 60-mile belt of totality were yet to see the grand picture of the corona, the object of our ambition. As the moon advanced across the sun the interest became greater. Presently the resonant tones of the ship's bugle sounded the call for action. A silence fell over the camp, the members of which had already been prepared to take advantage of each of the 106 seconds of totality which were given us to determine the substance of the corona.

Slowly and steadily the twilight deepened, bringing with it a chill such as is common to evening. The stars came out one by one, Venus particularly shining resplendent in the skies. Suddenly, like a pall, the shadow of the moon swept through the air and over the landscape. For a moment utter darkness surrounded us; then, as our eyes adjusted themselves to the new conditions, the glorious corona appeared in all its magnificence. There, shining in the cloudless sky with silvery effulgence, was the crown of glory which has been fittingly styled "God's crown," a decoration that no earthly monarch can aspire to—the corona.

Great rays of pearly white light shot out in penciled sheaths to distances double that of the sun's diameter, or several million miles in length. These silvery streamers seem built up around the disk of the sun in regular order, but apparently shoot out with greater or less intensity, which is characteristic of the ways of nature, into color too dim to be noted by direct vision, but which photography has enabled us to carry into microscopic depths. To the devoutly inclined, the Divine Being who rules the universe is never more manifest than at this moment. Well might they exclaim in the language of Job, "Doth he not see my ways and count all my steps, if I beheld the sun when it shines or the moon walking in brightness?" The masses of human beings who have surrounded our camp and thrown themselves prostrate to the ground, crying out in loud and distressed tones, show its effect on the superstitious; but no one who witnesses this beautiful picture will pass it by without a quickened pulsebeat or a display of

conflicting emotions. Even fowls and birds steal away to their perches as at eventide, and a sense of uneasiness pervades all animated beings.

The interval of totality, as has been stated, was 106 seconds, each of which was counted off in clear monotone by observers stationed at the chronograph for the purpose of aiding the photographers in timing the exposure of their plates.

As in the times of our remote grandfathers, when this mysterious phenomenon was ascribed to the anger of God, who was hiding his face from his children, there was rejoicing when the sun shone forth again, and hearty congratulations were extended to us all that the eclipse of 1905 had passed with probably good results to at least one of our parties; and a telegram came soon afterward telling me that the Daroca party had also been fortunate in observing it. Congratulations came anew. On our return to the ship that night a telegram from Captain Norris, in charge of the Guelma station, told that his party had taken a number of photographs which were most promising, and Captain Miller, of the *Minneapolis,* returning with his ship from the station off the coast of Spain, reported interesting and satisfactory observations obtained by his large number of draughtsmen in making pictures of the corona.

Leaving the *Cæsar* at Valencia to pick up the scattered parties and their instruments, the *Minneapolis* proceeded to Genoa, where another object of the cruise was inaugurated. Here the commander-in-chief and two assistants started an inspection of all the principal observatories in Europe, a report of which will take several months to properly record.

From Genoa the flagship proceeded to the beautiful harbor of Villefranche, where she was joined by the *Dixie* and *Cæsar,* the latter to collect the material belonging to the several eclipse parties for transportation to Washington, and the *Dixie* to take on board the people who must return home to work in other fields. Here a good-bye is said to the several invited guests who have contributed so much to the success of the American Eclipse Expedition of 1905, and the ships separate for the last time as the Special Service Squadron.

It has long been one of the glories of the American Navy that more than any other it has been employed in exploration and investigation, and in this way has done service to mankind in promoting the arts of peace. This remark was originally made by Sir Norman Lockyer as applying to the British Navy. While in London after the eclipse last summer, I said to this distinguished astronomer, who has probably done more in eclipse research than any other man, that I claimed the service I represented, considering the comparative short period of its existence, was the peer of the British Navy in this respect.

He replied, "And well you may do so; for, after the example set by your government, under your command I yield the palm to it, and I hope to make more in the use of the precedent thereby established than you have done with my phraseology."

Let me say further, that not only was the expedition beneficial to the arts of peace, but that, owing to the disturbed condition of European politics the past summer, the squadron lost none of its importance as a military organization. It was simply spending the spare time of the officers and crews of the ships in the advancement of science rather than in the pursuit of pleasures; and it is believed the visit of the Special Service Squadron to Spain will make easier the task of rebinding the ties of friendship which ever should exist between the present owners of our glorious country and those who made it possible for us to produce the finest world power of the globe.

And now, without going into the vicissitudes which detained the flagship in Europe until late in December, nor how, according to the newspapers, she went to Russia, which she did not do, we return to the finest spot of all—"Home, sweet home."

COMPOSITE DRAWING FROM PHOTOGRAPHS OF THE CORONA.
Colored from observations made with color chart, August 30, 1905.

THE BURIED CITY OF CEYLON

By John M. Abbot

COMPARATIVELY few people outside of Ceylon realize that on that little island in the Indian Ocean was once a civilization which when Christ was born was at its height. After all these centuries little of it remains except a few imperfect ruins of its most famous city, Anuradhapura.

At one time, about 200 B. C., this was the capital of the island. No estimate of its population has ever been made, but some idea of its size can be gathered from the fact that it harbored 96,000 Buddhist priests. In area the city occupied about 100 square miles, and it was divided into two parts, the inner, wherein are the remains of the temple and the monasteries, and the outer, where lived kings and the laymen.

The city was built in the wave of religious enthusiasm which struck Ceylon with the advent of Buddhism. Successive kings vied with each other to erect monuments worthy of themselves and their faith. But the hand of time and successive invasions by the Hindoo Tamils, who took pleasure in destroying what they could not replace, have left of this once mighty city of Anuradhapura nothing but a few granite posts in the thick jungle.

Thirty years ago these even were not visible, but from the Mahavansa, the one literary document in Singhalese history running from B. C. 542 to nearly our own day, the site of the ancient city was known, and so the British government set about the work of excavation. The greater part of the city was found about six or eight feet underground, and it is hard to realize that nature alone has accomplished this task.

Two thousand years ago the city was situated on a fertile plain. Water was brought from the mountains, forty miles distant, in a huge canal and stored in large artificial lakes, from which it was distributed to tanks in various parts of the city. One of the first acts of the Tamils was to destroy this system of irrigation, and with that ended the prosperity which the country had enjoyed. For four months of the year Ceylon is deluged by rains; for the rest of the time there is practically a drought. The tanks and lakes serve the same purpose for which the great dam of Egypt has been constructed—to keep back the water in time of plenty for use in time of need. Agriculture was brought to a standstill, and it was only by practically replacing these ancient works that the British government has made cultivation in this district possible.

The Tamils destroyed the city, and Nature completed the work by concealing the remains. Like Jerusalem after its final destruction, not one stone remained above another.

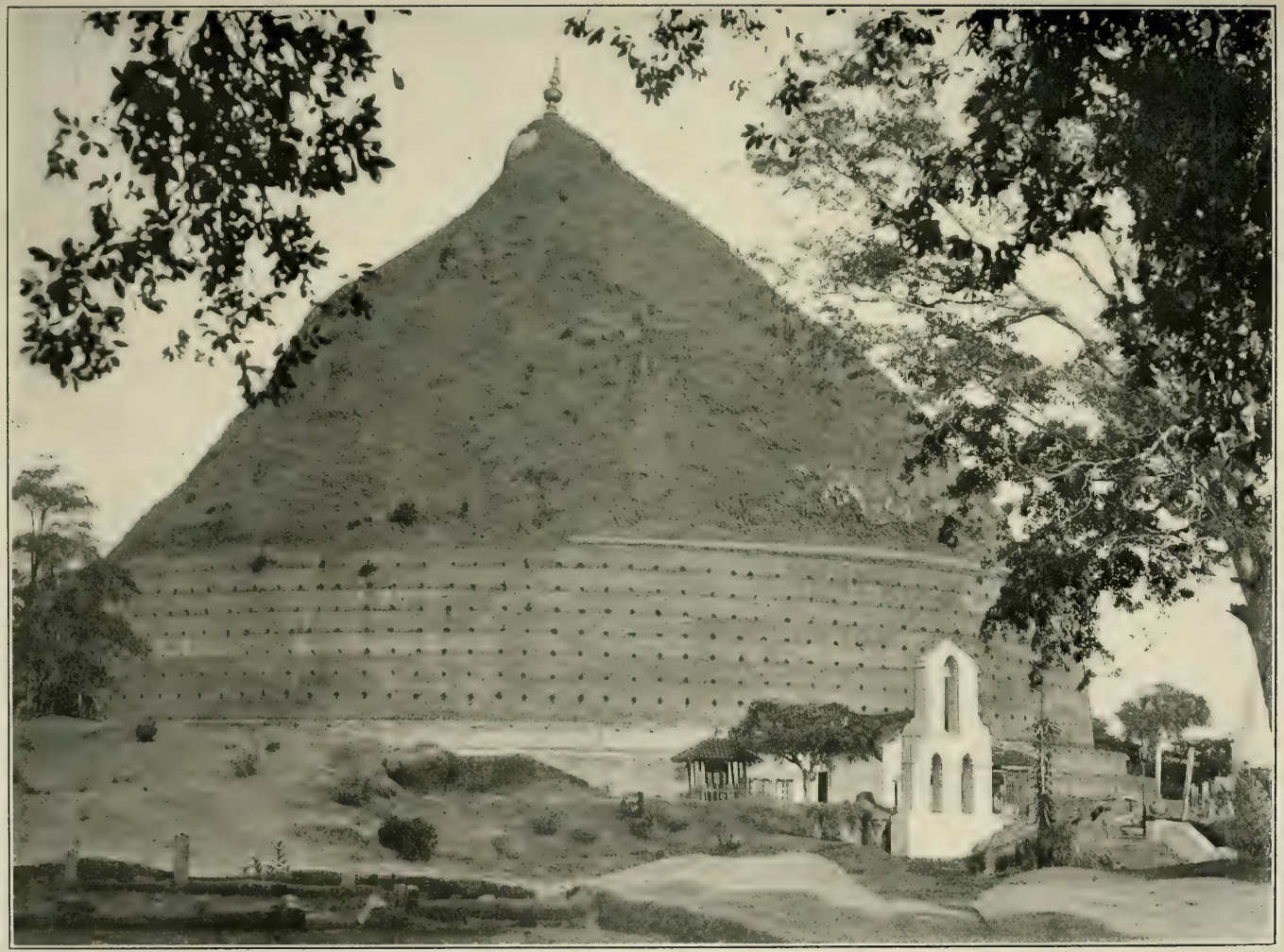
The most imposing objects in Anuradhapura are the Dagobas, of which there are four. They are huge mounds of solid brick shaped like beehives and from three to four hundred feet high. They were erected by kings to commemorate different events—one to celebrate the conquest of a rival, another to the glory of Buddha, and so on.

In the hot, dry atmosphere of Egypt they would be as perfect as two thousand years ago, but in Ceylon the hot summers and the rainy winters have very nearly proved too much for them.

Birds have dropped seed in their flight, and these, taking root in the cracks and crevices of the Dagobas, have grown until they have dislodged huge masses of brick, making frequent restorations necessary.

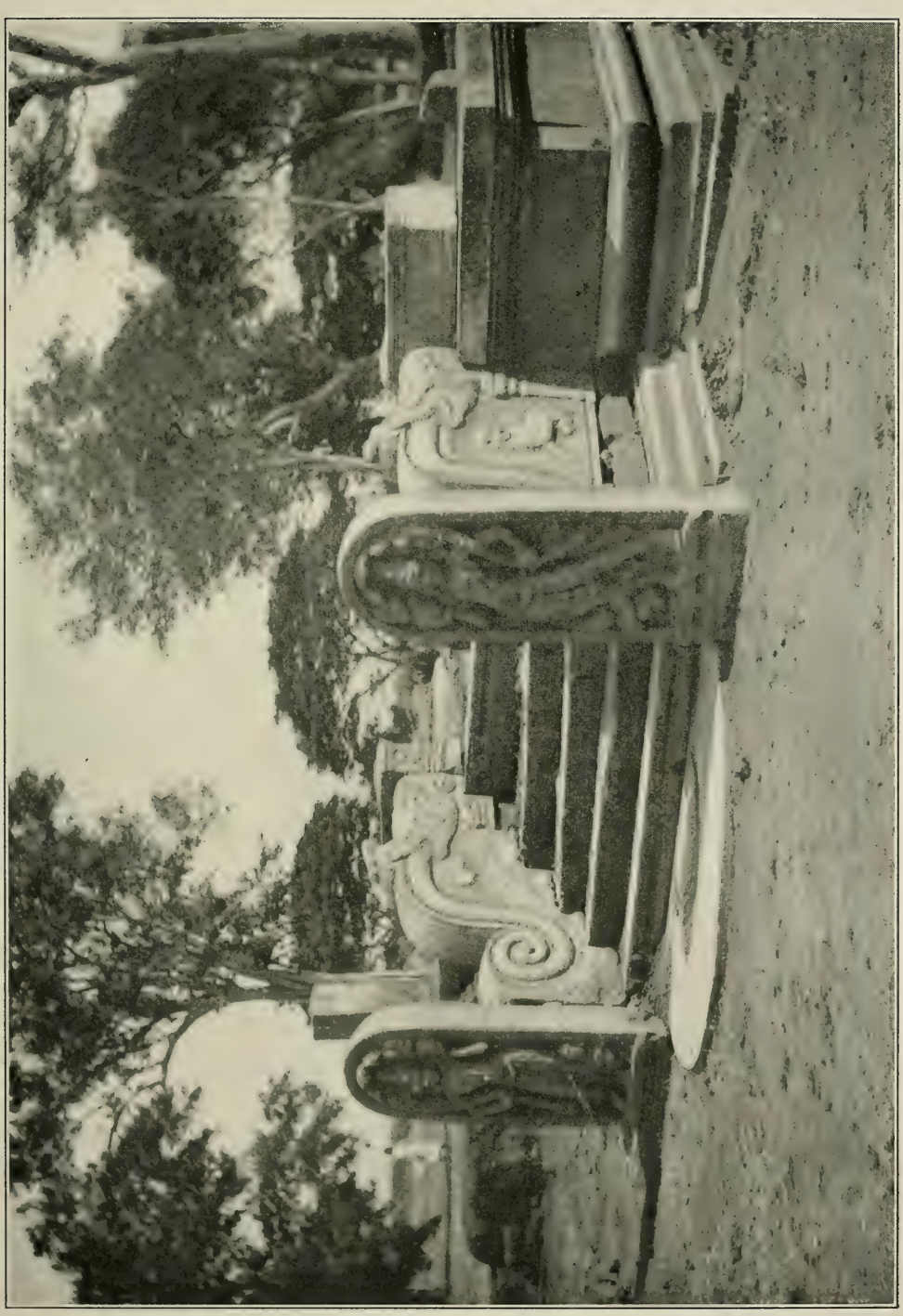
Originally these mounds were painted white with a composition called *chunam,* but now they resemble wooded hills from which in places the sides have fallen away, showing the bricks beneath.

Village Scene in Ceylon, near Anuradhapura. This and the succeeding illustrations are from photographs by Mr Abbot

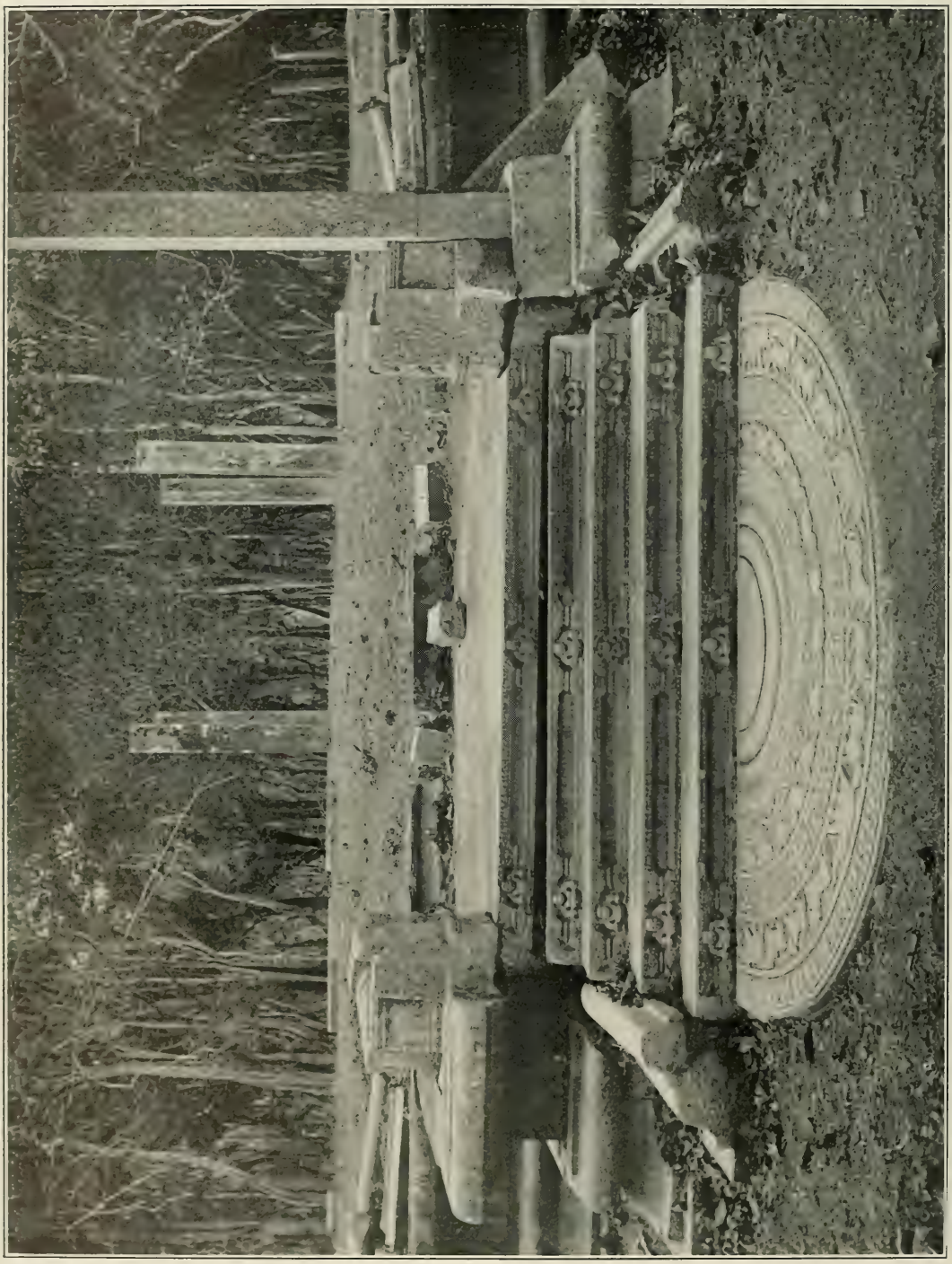


One of the Dagobas at Anuradhapura. The city was chosen capital by King Pondukabhoya in 437 B. C., and remained the capital of the island for 12 centuries

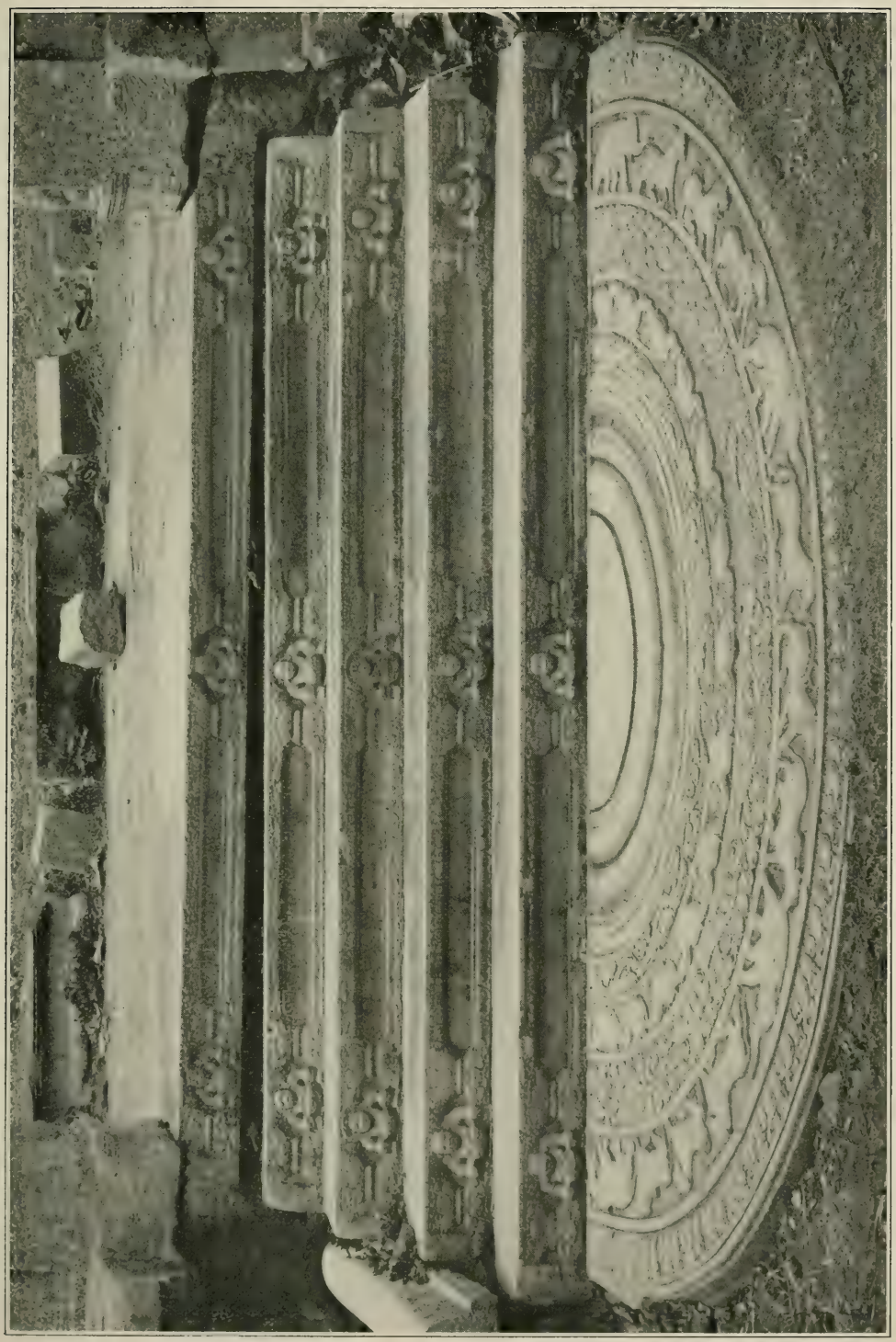
This Dagoba is the Resting Place of the Right Collar Bone of Buddha. It is the oldest monument in India or Ceylon, and was recently restored. The pillars seen in the picture originally supported a canopy over it



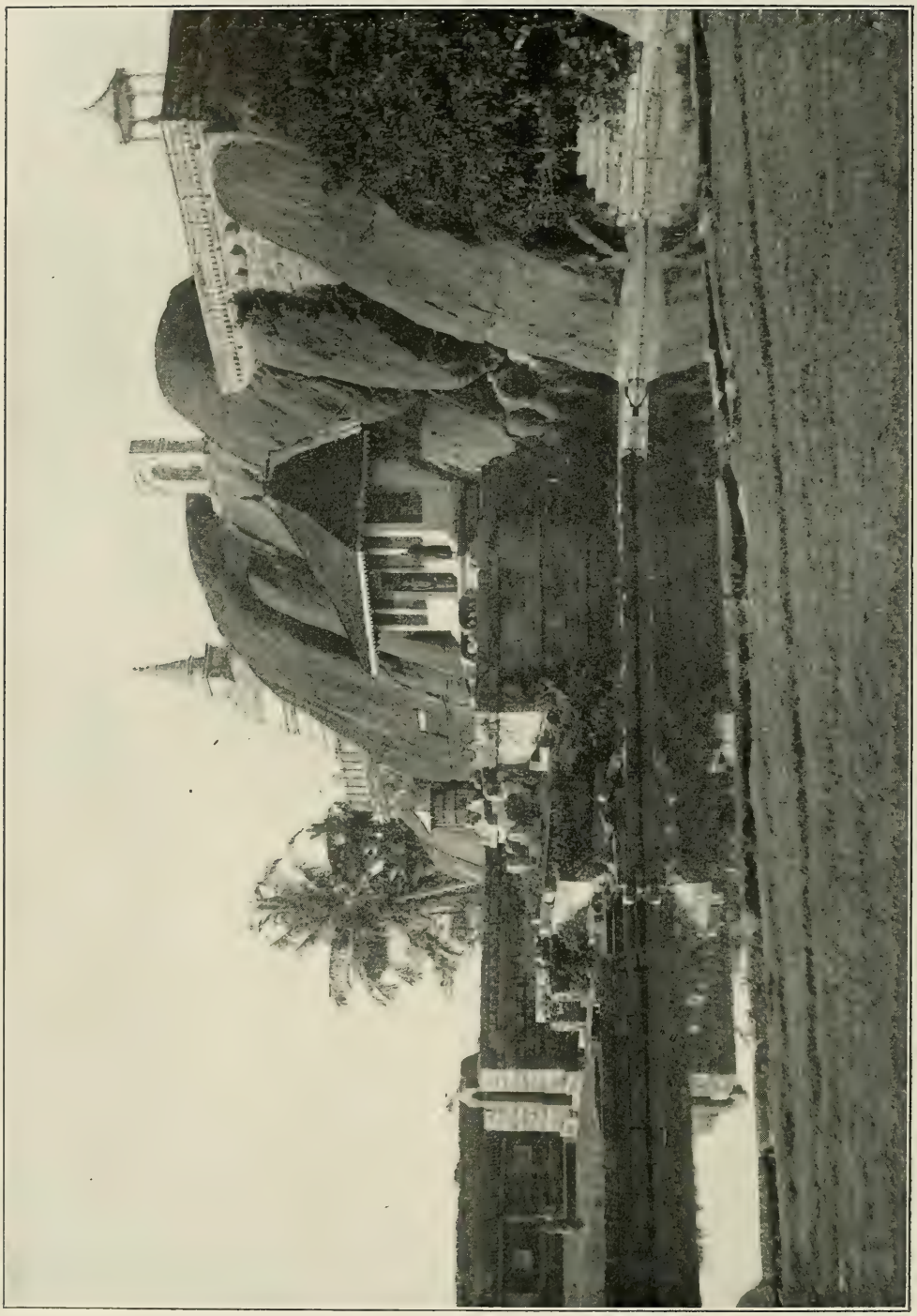
A View of the Steps Shown in the Preceding Picture



One of the Ancient Bathing Places, Anuradhapura



The Threshold of One of the Bathing Places, Anuradhapura (see page 622)



The Rock Temple, Carved Out of Solid Rock, Pollonnaruwa, Ceylon

In this Temple the Tooth of Buddha is Supposed to be Preserved—Kandy

It is only visible once or twice a year and on other times to distinguished strangers. People who have seen it say that it resembles more that of a crocodile. The original, according to unbelievers, was destroyed by the Portuguese. This and the preceding seven pictures are from photographs by James M. Abbot.

Sir Edwin Tennent says of one of them: "Even with the facilities which modern invention supplies for economizing labor, the building of such a mass would at present occupy 500 brick-layers from six to seven years and would involve an expenditure of at least a million sterling ($5,000,000). The materials are sufficient to raise 8,000 houses, each with 20 feet frontage, and these would form thirty streets each half a mile in length. They would construct a town the size of Ipswich or Coventry; they would line an ordinary railway tunnel 20 miles long, or form a wall one foot thick and ten feet high, reaching from London to Edinburgh." How long it took the original builders to construct these monuments is entirely a matter of conjecture.

Besides the Dagobas, there are many other objects of interest, not the least of which are the "Yogi" stones, divided into nine or twenty-five squares, at which the Buddhist priests were accustomed to gaze in order to get their minds in a proper frame for contemplation of the Infinite.

One is greatly impressed by the number and beauty of the Jokunas, or bathing places. Simple, even severe, in design, they are found near the sites of all the important buildings. Those which have been restored are beautiful in their simplicity and proportions. Before each of the buildings, and taking the place of the threshold, is one of the most unique remains of this ancient civilization. Although different in beauty and workmanship, they are all nearly the same. They have been dubbed "Moonstones," and that inexpressive term has to do duty for something both beautiful and artistic.

In shape they are half circles, but the words cannot do justice to the beauty and originality of the design. In concentric circles come first the border of lotus leaves, then a procession of lions, horses, Brahmany bulls, and elephants (see picture); another design of lotus leaves, and inside that a similar procession of geese. The center is taken up by half of the conventional lotus flower.

Probably a majority of people will be interested most by the fact that here is the oldest tree in the world. Its age is about 2,200 years and is undoubtedly authentic. It was brought to Ceylon about 300 B. C., and was a branch of the tree under which the Buddha Gautama sat when he attained Buddhahood. Greatly revered by the pilgrims, it has a temple erected in its honor. Through centuries it has been respected and spared by all. During its lifetime most of the world's history has been made. It was already old when Christ brought his message to the world, and standing in its present spot it witnessed the rapid rise of Anuradhapura and saw it sink to its present position of ruin and oblivion.

THREE OLD PORTS ON THE SPANISH MAIN*

By G. M. L. Brown

Member of the National Geographic Society

FEW expressions in English literature have given rise to more confusion than the term "Spanish Main." Applied originally, it would appear, to the waters of the Caribbean Sea and that part of the Atlantic Ocean traversed by the treasure ships of Spain, it gradually included the adjacent coasts of the continent, until, with most modern writers, it has come to mean this alone, and "sailing the Spanish Main," forsooth, will hereafter be an anachronism

*This is the first of two articles by Mr Brown; the second, "Across the Llanos," will appear in an early number.

View in La Guaira

until such time as airships shall have become popular in Caribbean countries. In these pages, however, with the reader's permission, the term will be applied, in its original sense, to the sea only—to the "golden, tropic sea," which, deserted by its galleons, bereft of its romance and its mystery, deserves, surely, to retain its memories and its ancient glorious name.

But the coast has its historic memories as well—this far-famed coast of *Tierra Firme* which Columbus declared to be the site of the earthly Paradise, "the most beautiful (lands) in the world, and very populous."

After Columbus came Alonzo de Ojeda, who sailed westward to the Gulf of Maracaibo, where he chanced upon some Indian villages built on piles, and so named the land Venezuela, or "Little Venice." In the next year—the opening year of the sixteenth century—Pere Alonzo Nino sailed over the same course and, besides confirming the reports of his predecessors as to the richness of the vegetation and its numerous inhabitants, was fortunate enough to secure a quantity of pearls. Here, then, was a land yielding pearls, and probably gold, for the treasure-seeker; and Indians, suitable for slaves, so the Spaniards thought. To *Tierra Firme,* therefore, an adventurous rabble soon found their way, and the horrors of the Spanish Conquest began.

For a moment, however, the black shadow is lifted, and one Bartholomew de Las Casas steps forth—a simple priest, afterward a bishop, but "a figure," as Fiske eloquently observes, "which is in some respects the most sublime and beautiful in the annals of Christianity since the apostolic age." Las Casas had dedicated his life to the protection and conversion of the Indians, and, securing a grant from the king for a tract of land with two hundred and sixty leagues of

Street Scene in Caracas, but typical of any Venezuelan city

seaboard (the whole coast, in fact, from the peninsula of Paria to the province of Santa Marta), he set about organizing a semi-religious expedition, which, had it been successful, might have changed the entire history of Venezuela.

The first settlement was to be made at Cumana, where some Franciscan monks had established themselves in 1515, and was actually begun by Gonzalez Ocampo in 1520, though his cruelty and treachery toward the Indians brought Las Casas' cherished schemes to naught, a fitting prelude to the three—or, shall I say, nearly four—centuries of strife and misery that followed. Las Casas arrived at Cumana in 1521, but during his subsequent absence in Haiti the little colony was driven away by the enraged and deluded Indians, who thus banished from their shores the one man who would, and could, have saved them from their piteous fate.

Apart from the hallowed memories of this devoted priest, Cumana, or New Toledo, as it was formerly called, has the distinction of being the first European settlement in Venezuela, and with the exception of a supposed settlement of the Portuguese upon the Amazon, the first on the continent. Ocampo was preceded just one year by Cortes in Mexico, and it was ten years later that Pizarro set out for Peru. When John Cotton knelt upon the shore at Plymouth, surrounded by his devout pilgrim band, and asked God's blessing upon their enterprise, a century lacking one year had elapsed since his noble prototype had debarked his little following upon the lonely Pearl Coast, and prayed with equal earnestness for divine assistance in establishing a Christian colony. One prayer was answered, and the other was not, and Providence only knoweth why; but certainly no more sacred mission was ever undertaken than that of Las Casas to *Tierra Firme*. When we read, therefore, of the subsequent misdeeds of the *conquistadores*, let us not forget that the "Apostle of the Indies" also was a Spaniard, and, were it not for the one great mistake of his life—his defense and promotion of negro slavery, though the facts have been grossly exaggerated and, indeed, perverted—his work would perhaps be ranked as the greatest moral factor in the early history of the New World.

It is hard to leave this heroic figure and the desolate little settlement that marked the failure of his first great project, but Cumana, in time, became a prosperous town—that is, as prosperity was understood in the Spanish colonies—and has at least one other claim upon our notice, viz, that it was here that Humboldt landed and remained for a time, with his friend Bonpland, before beginning those remarkable journeys that added so materially to all branches of natural science, and, perhaps even more important at this day, to our knowledge of the economic and social conditions of colonial Spain—conditions that might never have been understood had this indefatigable traveler and scientist not arrived so opportunely before the revolutionary struggle began.

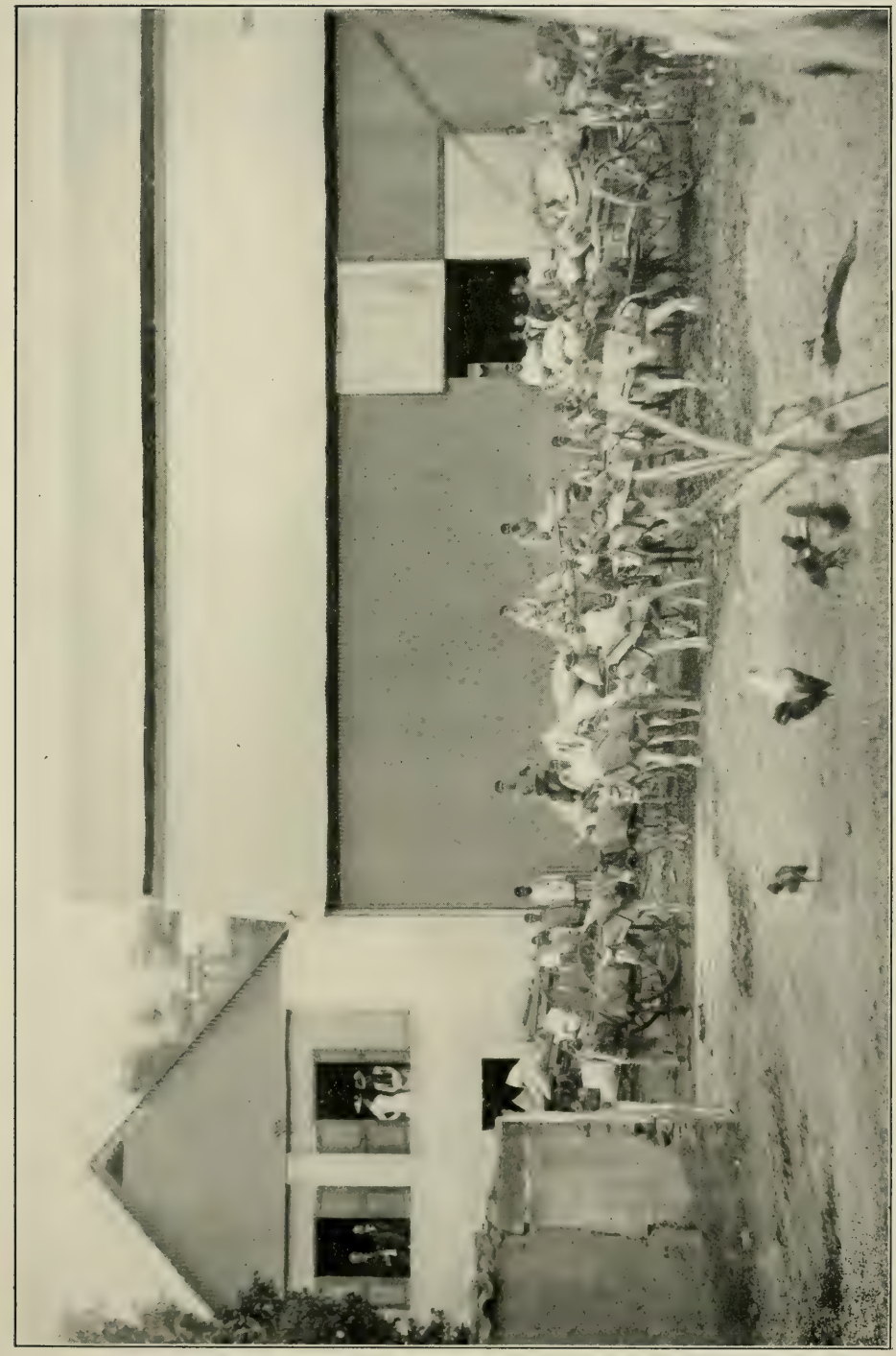
Cumana today is a humdrum city of about 10,000 inhabitants, the capital of the State of Bermudez, and an important port in the "Orient," as the eastern states of Venezuela are called, though the government of late has been openly hostile to its interests. It certainly presents a sorry contrast to the town of a century ago, then the independent capital of a large province, or rather of two, an important ecclesiastical center, and ranking easily first among all the cities of the coast in the culture and intelligence of its inhabitants, as indeed a Venezuelan (not a native of Cumana) informs me is still the case.

Cumana is as yet almost unknown to the traveler, partly owing to the ignorance or lack of enterprise of the steamship companies that make it a port of call; but some day the tourist tide will set in, and not only the city itself, but the delightful hill country of the interior, as well as the neighboring towns of Barcelona—which, like Cumana, was the

A Coffee Train Entering Maracaibo

scene of many stirring events during the war of independence—and Carupano, noted for its trade in agricultural products and for its incomparable rum—all, no doubt, will in time be "stopped over" at and duly photographed, as will the extensive *salinas* or salt beds of Araya and the neighboring island of Margarita, where the famous pearl fisheries are situated. It is a country well worth visiting.

"So, westward-ho they ran," writes



A Coffee Mill near Maracaibo

The beans are here removed from the husks by machinery, cleaned, and packed in bags ready for shipment.

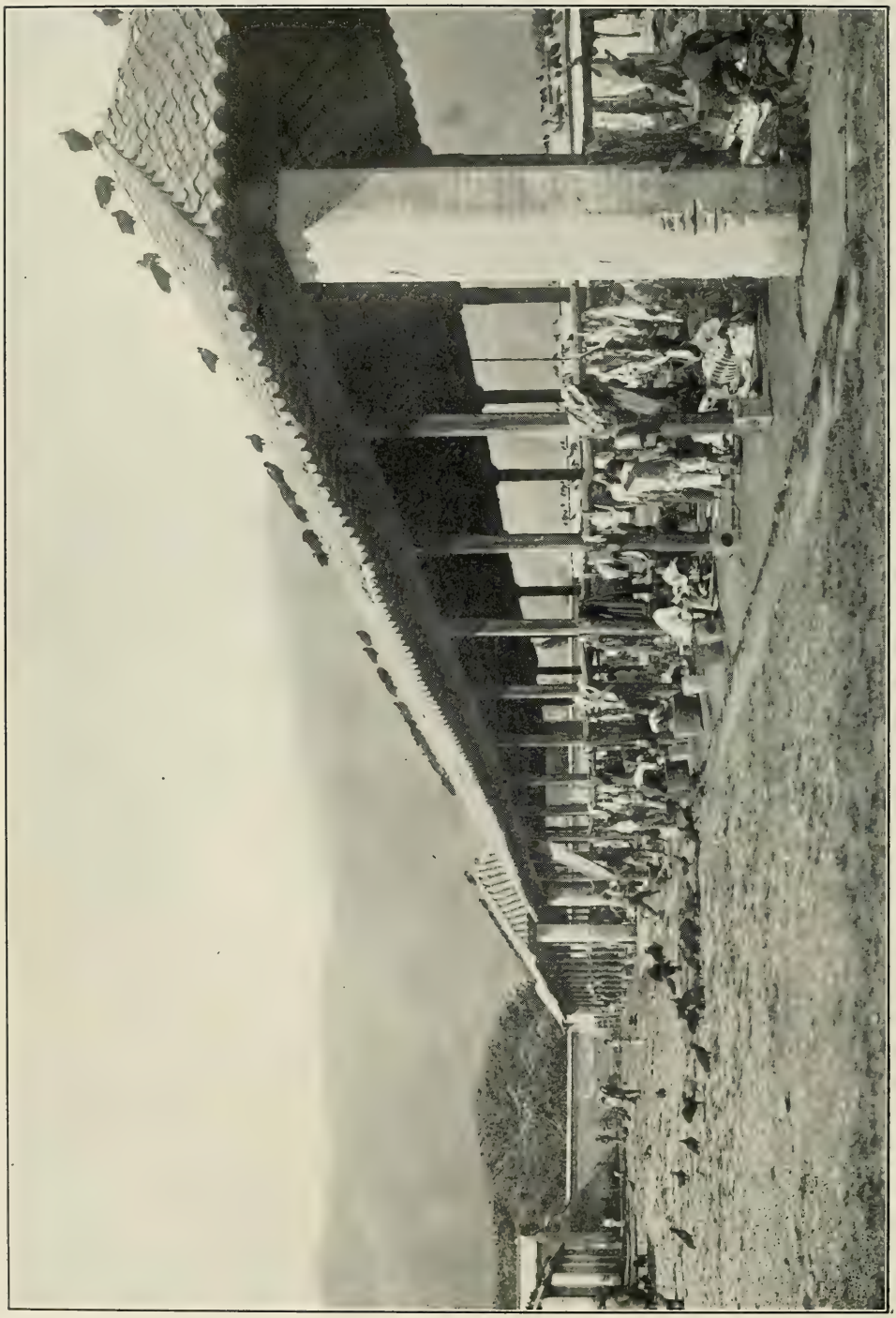
One of Better Class Residences of Caracas

A Street in Caracas

A Maracaibo "Caballero"

Kingsley of the good ship *Rose,* as she skirted the coast between Cape Codera and La Guaira, "beneath the mighty northern wall, the highest cliff on earth, some seven thousand feet of rock parted from the sea by a narrow strip of bright, green lowland. Here and there a patch of sugar-cane or a knot of cocoanut trees, close to the water's edge, reminded them that they were in the tropics; but above, all was savage, rough and bare as an Alpine precipice. Sometimes deep clefts allowed the southern sun to pour a blaze of light down to the sea marge, and gave glimpses far above of strange and stately trees lining the glens, and of a veil of perpetual mist which shrouded the inner summits, while up and down, between them and the mountain side, white, fleecy clouds hung motionless in the burning air, increasing the impression of vastness and of solemn rest, which was already overpowering."

And so, indeed, as Kingsley so vividly pictures them, do these mighty cliffs appear; and one learns with regret that the talented novelist should never have beheld their awful grandeur, he who alone, perhaps, has done justice to the scene. Inaccuracies, to be sure, have crept into the description, and as the steamer approaches from the north the traveler may fail, through a misjudgment of distance, to appreciate the magnitude of the greenish-brown mass before him; but presently he spies something to measure with, a cluster of buildings, a little toy city, which he is told is La Guaira, while apparently but a stone's throw away lies Macuto, the well-known watering place. Then, perhaps, though almost too late—for the Red D line has a schedule to maintain—does the full impressiveness of the scene burst upon his awakened senses; and if there yet be time, let him gaze intently before him, for the view



A Venezuelan Abattoir. (Note the vultures on the roof)

entirely changes when he lands, and not until he is once more on board and the vessel well in the offing can the noble proportions of the "Silla" again be appreciated. In my case, unfortunately, my first view was my last.

La Guaira, for all its fame, or rather notoriety, is a city of but fourteen thousand inhabitants, or about two-thirds the size of Bangor, Maine; but even this seems an overestimate when one climbs the hillside and looks down upon its jumbled mass of dark-red roofs, with a thin line running east and west along the shore and a short spur following a cleft in the otherwise impassable barrier behind it. Prominent at the water front are the market-place, the large custom-house—practically the *raison d'etre* of the city—the inevitable plaza, and the new shore batteries, erected by President Castro.

Here, also, is the terminus of the La Guaira and Caracas Railway, and jutting out from the shore a distance of two thousand feet or more is the famous breakwater, which has done so much to increase the traffic of the port, though the passenger is apt to forget, when charged to set foot upon it and denied the alternative of hiring a boat, that this formerly was one of the most disagreeable roadsteads in the world. Anyway, in a land of habitual "graft," why should the stranger be spared on the day of his arrival? "Why, indeed!" echoes the collector of customs, who incidentally is the proprietor of the Hotel *Neptuno,* the only decent hostelry in the place, as he delays the inspection of luggage till the Caracas train has departed and complacently watches the passengers stream off for breakfast—wherever they like to go, of course!

La Guaira can boast of several churches (one a rather imposing structure), a bull ring, a large theater, and a diminutive fort, the latter perched high above it, like the turret of a battleship, and provided with the same armament as the shore battery, viz, two Cruezot guns of the latest type. To one side, but below this fort, stand the ruins of the old governor's castle, where the "Rose of Torridge" dwelt, and if the tourist be so inclined he may seat himself upon a crumbling wall, and, with the whole scene before him and the sound of the surf in his ears, may imagine he sees the brave Devon lads fighting their way to the boat, their best loved leader a prisoner, several of their comrades dead, and the daring venture of the *Rose,* so they think, an utter failure.

An American who recently came to La Guaira and has experienced exceptionally pleasant weather calls the coast hereabout the "Riviera of the Tropics," while a well-known writer who delights in big phrases styles Macuto the "Saratoga, the Newport, and the Coney Island of Venezuela, all in one." Both comparisons are about as apt as is the term "Paris of South America," applied to Caracas, a comparison, to digress for a moment, that unquestionably aided the floating of a recent continental syndicate, which was capitalized at several million francs and proposed establishing a large gambling casino in that city. The enterprise, of course, came to grief, though the disappointment of the projectors who reached Caracas could hardly exceed that of the American tourist who should travel to La Guaira—hot, ill-smelling old town that it is!—expecting to find a new Riviera. Nevertheless, La Guaira has been dealt unjustly with, as well, even in the matter of smells, which few tropical towns are free from, not excepting the much-governed city of Port-of-Spain; and while one can sympathize with the former American consul, who in the elation of departure wrote:

'Farewell, ye gloomy *casas*,[1] *mejor dicho*,[2] prison cells;
Ye narrow, crooked *calles*,[3] reeking with atrocious smells."

and in another stanza:

"Home of the wailing donkey and the all-abounding flea,
Manana,[4] *gracias a Dios*[5] I bid farewell to thee;"

it does seem as if the final lines, both

from a sense of fair play and for diplomatic reasons, might have been somewhat modified:

"Good-bye, ye Latin greasers, *su atento servidor;*[6]
Que van bien;[7] *pues adios;*[8]—my boat is on the shore.
Oh dirty people, dirty homes, oh despicable spot,
Departing I will bless you in your dirtiness and rot!"

Equally unjust is the cool assertion—pardon the seeming paradox—of the writer above referred to, who gives the town a steady temperature of "100° Fahrenheit from one year's end to another." As a matter of fact, the mean temperature is about 84° Fahrenheit, and the maximum very little over ninety, which, owing to the moisture of the air, could easily deceive the perspiring tourist. "It is generally the duration of a high temperature," observes Humboldt, "and not the excess of heat, or its absolute quantity, which occasions the sufferings of the inhabitants of the torrid zone;" and eighty-four degrees with a humid atmosphere is certainly excessive.

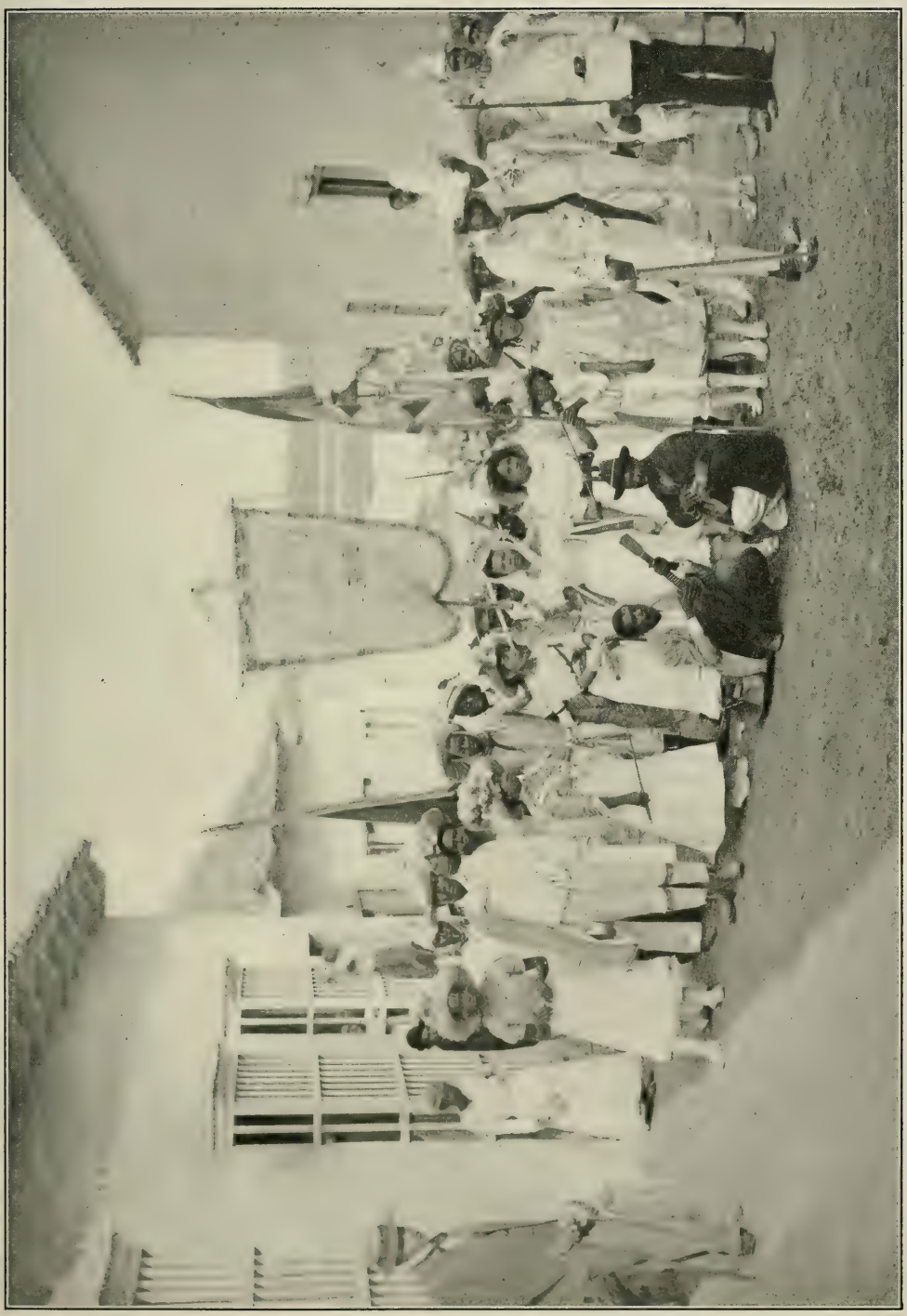
Another stigma cast upon La Guaira is its unhealthfulness, and especially the prevalence of yellow fever. La Guaira, be it known, is not particularly unhealthful, certainly not so unhealthful as Caracas, and while a mild form of yellow fever lurks in the neighborhood, it is not greatly to be dreaded. "Indeed," the inhabitants might exclaim, "who gave us the yellow fever? Was it not communicated to the city originally by a vessel from Philadelphia, after we had enjoyed more than two centuries of immunity?" This charge, to be sure, has not been proven, but the crew of an American vessel in port (in the year 1799) were actually the first to be stricken, and local historians draw their own conclusions.

La Guaira was founded in 1558, two years before our ancient city of St Augustine, and has shared the usual vicissitudes of the Spanish settlements upon the coast, having been repeatedly attacked by pirates and foreign fleets, several of which, notably that of the British commodore Knowles, were successfully repulsed. The city, furthermore, was destroyed by the great earthquake of 1812, and experienced many exciting events in the war of independence, as, indeed, it has at intervals ever since, not least of which was the blockade of the powers a few years ago. This indignity, however, its officials assert, will never be repeated, and they point to the well-equipped batteries, silent and grim, but ever ready for the enemy—ready, that is, in a Pickwickian sense!

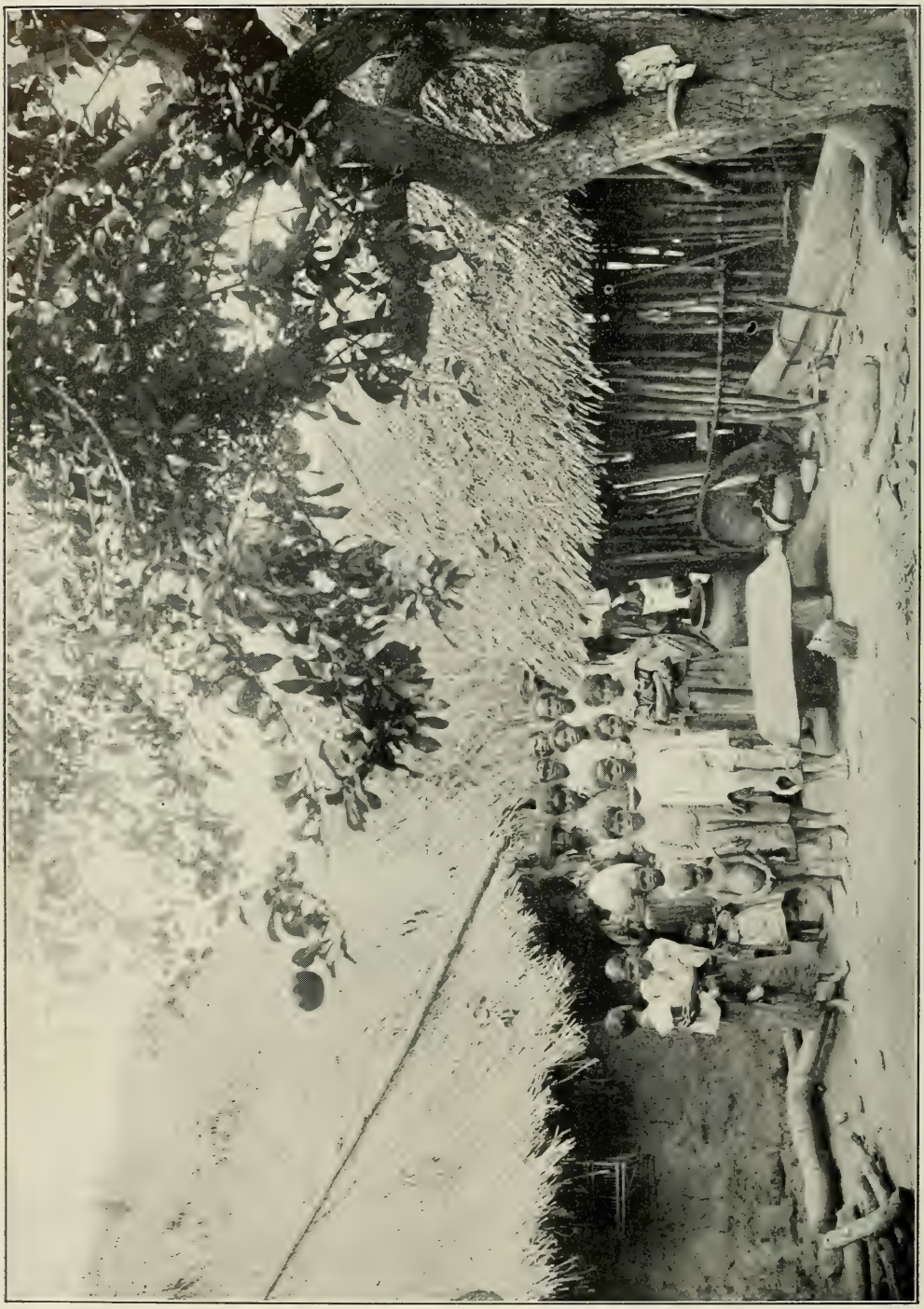
I have coupled Maracaibo with Cumana and La Guaira in naming this article, though the situation of the former makes the title plainly a misnomer. It is difficult, however, in passing to this western city to resist mentioning a few of the interesting towns in the intervening region, historic old places, such as Tocuyo, founded in 1545; Coro, the ancient capital of the province of Venezuela and the seat of the Welsers, founded in 1527, just seven years after Cumana, and in reality the first permanent settlement in *Tierra Firme;* Carora, founded in 1572, more than half a century after Cumana, yet a hundred and ten years before William Penn established his colony on the Northern Continent; Ocumare—but why continue the list; no more historic region can be found in the New World than these southern shores of the Caribbean Sea, and none, certainly, are more neglected by the traveler.

Maracaibo, as the reader is aware, is situated upon the lake of the same name, or rather upon the strait connecting the lake with the outer gulf. Like La Guaira and Puerto Cabello, it has excellent steamer communications with Curacao and New York, an American line having built two vessels of sufficiently light draft to pass the dangerous sand bars that obstruct the entrance to the lake. Were navigation entirely unobstructed and the city not preyed upon as it has

[1] Houses; [2] better said; [3] streets; [4] tomorrow; [5] thank God; [6] at your service; [7] good luck to you; [8] so good-bye.



Carnival in Venezuelan Town



The Rising Generation. A typical scene on the Venezuelan coast regions

A Religious Festival on a Cocoa Estate in the Orinoco Delta

Country Road, near La Guaira

been by every government since the time of Guzman-Blanco, it would long since have been one of the most important ports in Caribbean countries, for behind it lies a vast lowland region, rich in all manner of tropical products and only rendered inaccessible in places by the very profusion of its wealth. Furthermore, Maracaibo is the port of a considerable section of Colombia, and nearly all of the coffee that bears its name comes either from across the boundary or from the Venezuelan Cordillera region south and east of the lake. At intervals of a year or so, it would appear, President Castro from some fancied grievance prohibits all intercourse with the neighboring republic; whereupon the exports of "Maracaibo" coffee fall to half the usual amount, only to leap to an abnormal figure when his wrath has been appeased Colombian cities are allowed to discharge their accumulated supply. When I outlined this article the barriers, if I mistake not, were up; at the present writing they have been removed. And yet Colombia, like Curacao, was at one time a haven of refuge when the President was a fugitive. What unheard-of indignities might they not suffer today, had they not received him so hospitably!

Maracaibo has the unenviable reputation of being one of the most unhealthful cities in the world, which is sheer nonsense, for its climate is said to be rather agreeable, though moist and hot. Yellow fever is prevalent at times, but of such a mild type that it is seldom fatal, and German commercial houses in Cucuta, where this disease, on the contrary, is most deadly, are said to station their newly arrived clerks in Maracaibo until they have taken the fever before allowing them to enter the interior. I did not believe this story until a gentleman of unquestionable veracity assured me that such is actually the case, and that Maracaibo fever, like the measles, is really welcomed, that the ordeal may be over for all time.

Perhaps Maracaibo's bad name originated in the story of the consul and the coffin, of which many versions are current. Ex-Minister Scruggs gives it as follows:

"A western politician of some local prominence, who had long been pressed upon the attention of our State Department for a consular position in South America, was finally nominated and confirmed as consul to Maracaibo, much to the disgust and discomfort of the incumbent, who wanted to retain his place. The new consul arrived at his post in mid-summer, and became the guest of his predecessor, whom he was about to relieve. Discovering a metallic coffin in an obscure closet of his bedroom, he inquired of his host the next morning why such an article of furniture should be there. The host was profuse in his apologies, but added by way of explanation that such things were not unusual in Maracaibo, especially during 'the fever season, which,' said he, 'is just now setting in!' The new consul took the return steamer for New York, leaving his predecessor undisturbed."

Here again I was long dubious about accepting such a good yarn seriously till I was assured not once, but a dozen times, that it is essentially true; that the wily consul is none other than the present incumbent, and that he himself is nothing loath to admit the fact. Yet few travelers go to verify either story, perhaps from an unmanly feeling that if they have been misinformed they may pay for the error by taking up a permanent residence there, without the assurance even of a consular coffin.

I am writing of Maracaibo as if it were an out-of-the-way village instead of an important city and port, with ocean vessels coming and going and fleets of sailing craft plying to various towns upon the lake, as well as to up-river ports—a city that can boast of electric light, tramway lines, telephones, telegraphs, a submarine cable, a splendid theater, a legislative palace, seven churches, a dockyard, and, to quote verbatim from the official report, "2 clubs, 5 hotels, 17 inns, 24 restaurants, and all modern improvements," which, of course, is equally misleading.

Maracaibo was founded in 1571, and has had its ups and downs, like the other cities upon the coast, the greatest disaster in its history being the raid of the notorious buccaneer, Morgan, in 1669, which, had it been two years later, might have been regarded as a centenary celebration. Today, happily, the city enjoys comparative prosperity, and despite the unfortunate reputation for unhealthfulness that it has gained abroad, and, within the republic, the equally unfortunate association in the popular mind with its huge dungeon, crowded with political suspects and the wretched leaders of the last revolution—for Maracaibo and its prison have become almost synonymous terms in Venezuela—its citizens might be excused for boasting of their western metropolis, the only city upon the Venezuelan coast which has refused to be merely a port of call for vessels—an aggregation of buildings, so to speak, surrounding a customs-house.

Notwithstanding the drawbacks, from the tourist's standpoint, to many of the places I have mentioned, I believe the trip to and from the Venezuela coast will soon become an attractive one, even to the comfort-loving American. He will visit Caracas, La Guaira, and Macuto, and perhaps Puerto Cabello, returning either by Curacao and Porto Rico or by Margarita, Trinidad, and the beautiful islands of the Windward group; and if he has read and treasured as a child the strange and terrible stories of the Spanish Main, with its gold-laden galleons, its fierce buccaneers, and the occasional English freebooter from the Drake of history to the Amyas Leigh of fiction, no trip could be more fascinating to him. The invalid, also, will in time be attracted to these southern waters, and will find to his surprise that a voyage through the Caribbean Sea is almost as delightful and quite as beneficial as a tour of the Mediterranean.

FARTHEST NORTH

AS this number goes to press news is received of Peary's success in reaching the "Farthest North," 87° 6′. Our information is limited to the brief telegrams printed below, but they tell enough to show that the latest expedition of Peary has been the most successful he has yet made. The public will probably be most interested in the fact that Peary has won back for America the record of the farthest north, held by Nansen and Abruzzi since 1896. Previous to Nansen's voyage, America had held the record for 14 years by reason of the achievement of Lockwood and Brainerd, of the Greely expedition, in reaching 83° 24′.

Peary's first telegram was as follows:

"HOPEDALE, LABRADOR,
"VIA TWILLINGATE, NEWFOUNDLAND,
"*November 2*, 1906.

"*Secretary Herbert L. Bridgman, Peary Arctic Club:*

"*Roosevelt* wintered north coast Grant Land, somewhat north Alert's winter quarters. Went north with sledges February via Hecla and Columbia. Delayed by open water between 84 and 85 degrees. Beyond 85 a six days' gale disrupted ice, destroyed caches, cut off communication with supporting parties, and drifted east. Reached 87 degrees 6 minutes N. latitude over ice drifting steadily eastward. Returning ate dogs. Drifted eastward, delayed by open water. Reached north coast Greenland in straitened conditions. Killed musk oxen and returned along Greenland coast to ship. Two supporting parties driven on north coast Greenland. One rescued by me in starving condition. After one week's recuperation on *Roosevelt* seldged west, completing north coast Grant Land, and reached other land near 100th meridian. *Roosevelt* magnificent ice fighter and sea boat. No deaths or illness in expedition.

"PEARY."

A more detailed account of the new land which Peary reports he has discov-

Photo by Gilbert H. Grosvenor

Commander Robert E. Peary, U. S. N.

Photos by Robert E. Peary

Mat Henson, the Companion of Peary in all Sledging Trips

ered near the 100th meridian is awaited with much interest. There are many possibilities connected with this new land. It may be simply a small island or it may be a large body of land extending considerably northward, and thus afford future explorers opportunity to carry their base nearer to the Pole than has been possible in the past. In the June, 1904, number of the NATIONAL GEOGRAPHIC MAGAZINE, Dr R. A. Harris, of the U. S. Coast and Geodetic Survey, who had been making a careful study of tidal records taken on the north coast of North America, argued that there must be a considerable body of land in the unexplored region to the north. He could account for the rise and fall of the tides there in no other way. Dr Harris outlined the supposed land as extending eastward to about the 100th meridian, and also to the Pole. Perhaps the land Peary has found is this "supposed land."

Peary took his ship, the *Roosevelt*, further north than any ship had previously been, and passed the winter on the north coast of the most northern known land. In every previous expedition Peary has been prevented from getting his ship to this point because the channel through which his ship must pass has every time been choked with ice. As a result, he has always been obliged to make his base far to the south of his last base, which was only 500 miles from the Pole. It has been generally believed that if he could once get his base as far north as he did last year, he would reach the Pole, for the four great sledging journeys he has made in the arctics have averaged more than this distance to the Pole and back. Open water

Photo by Robert E. Peary

A Polar Bear Hunt

Photos by Robert E. Peary

Musk Oxen, Grant Land

Sledding Supplies to the Land

Photo by Gilbert H. Grosvenor

Herbert L. Bridgman, Secretary of Peary Arctic Club

and the drift of the ice, however, prevented his advancing further than 87° 6′, which is 174 geographical miles, or 200.36 statute miles, from the Pole.

It is evident that Commander Peary is planning one more campaign against the Pole, for he telegraphed Mr Morris K. Jessup, the president of the Peary Arctic Club and its most generous patron, as follows:

"*Morris K. Jessup, president of Peary Arctic Club, from Hopedale, Labrador, via Twillingate, N. F.*

"Steamer *Roosevelt* now here repairing rudder and stern, taking ballast and awaiting arrival mail steamer to secure coal. Return voyage incessant struggle with ice to Cape York, September 26. Then storms and head winds to Labrador coast, October 13. Carried away two rudders, stern post, and two blades of propeller, foretopmast and spanker boom. Lost one boat, burned all coal and some interior beams, using wood and blubber along the coast.

"Expect to communicate again from Chapeau. Progress will be slow, but have no anxiety for our safety, and give no credence to exaggerated reports.

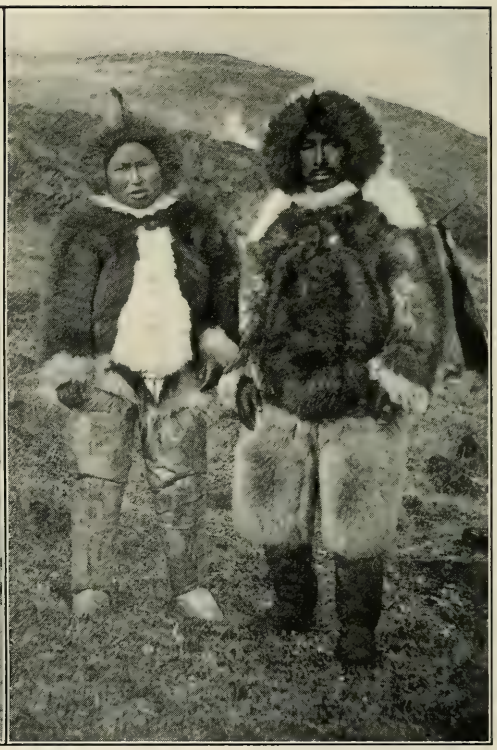
"*Roosevelt* is returning this year for additional supplies and for repairs. Several tons of whale meat dog food thrown away last fall after poisoning number of the dogs. Other supplies lost by the breaking of ice in April. PEARY."

Commander Peary's polar steamship, the *Roosevelt,* left New York on her long journey in search of the North Pole July 16, 1905. The *Roosevelt* was built in Maine, and was refitted at New York before starting.

Photo by Gilbert H. Grosvenor

Captain Sam Bartlett, Sailing Master

An Eskimo Child



Photos by Robert E. Peary

Eskimo Man and Wife

The vessel, for which funds were furnished by the Peary Arctic Club of New York, was designed particularly for arctic exploration. She cost about $100,000. The vessel has a crew of 20 men, under Captain Bartlett.

The best part of the last 20 years Commander Peary has given to Arctic work. He has mapped over 600 miles of coast line, measuring from headland to headland, without following the numerous deep indentations. Nearly half of it is entirely new coast line which Peary alone has seen.

He has proved Greenland an island and mapped its northern coast line; he has defined and mapped the islands to the north of Greenland, known as the Greenland Archipelago; he has shown that an ice-covered Arctic sea probably extends from the Greenland Archipelago to the North Pole; he has reached the most northerly known land in the world; he has gained the most northerly point yet reached—87° 6′; he has studied the Eskimo as only one can who has lived with them for years; he has added much to our knowledge of Arctic fauna and flora; of the musk ox, the Arctic hare, and the deer; the notes he has made during the past years will benefit meteorology and geology.

Aside from the satisfaction of having done a great and heroic work, there has been no material gain for Mr Peary in these years devoted to Arctic discovery. He is known as one of the most talented men in the naval service, and if he had remained in active service would now probably hold a higher official rank than he does. Mrs Peary, the devoted and able assistant of her husband's plans; Mr Morris K. Jessup, and Mr Herbert L. Bridgman, president and secretary of the Peary Arctic Club, share in large measure in the success of the expedition.

TWO GREAT UNDERTAKINGS*

OPERATIONS under the Reclamation Act, which I signed on June 17, 1902, have been carried on energetically during the four years since that date. The Reclamation Service, consisting of over 400 skilled engineers and experts in various lines, has been organized, and it is now handling the work with rapidity and effectiveness. Construction is already well advanced on twenty-three great enterprises in the arid States and Territories. Over 1,000,000 acres of land have been laid out for irrrigation, and of this 200,000 acres are now under ditch; 800 miles of canals and ditches and 30,000 feet of tunnel have been completed; and 16,000,000 cubic yards of earth and 3,000,000 cubic yards of rock have been moved. Detailed topographic surveys have been extended over 10,000 square miles of country within which the reclamation work is located, and 20,000 miles of level lines have been run. Three hundred buildings, including offices and sleeping quarters for workmen, have been erected by the Reclamation Service, and about an equal number by the contractors. Over 10,000 men and about 5,000 horses are at present employed.

The period of general surveys and examinations for projects is past. Effort is now concentrated in getting the water upon a sufficient area of irrigable land in each project to put it on a revenue-producing basis. To bring all the projects to this point will require upwards of $40,000,000, which amount, it is estimated, will be available from the receipts from the disposal of public lands for the years 1901-1908.

We may well congratulate ourselves upon the rapid progress already made, and rejoice that the infancy of the work has been safely passed. But we must not forget that there are dangers and difficulties still ahead, and that only unbroken vigilance, efficiency, integrity, and good sense will suffice to prevent disaster. There is now no question as to where the work shall be done, how it shall be done, or the precise way in which the expenditures shall be made. All that is settled. There remains, however, the critical question of how best to utilize the reclaimed lands by putting them into the hands of actual cultivators and home-makers, who will return the original outlay in annual installments paid back into the reclamation fund; the question of seeing that the lands are used for homes, and not for purposes of speculation or for the building up of large fortunes.

The pressing danger just now springs from the desire of nearly every man to get and hold as much land as he can, whether he can handle it profitably or not, and whether or not it is for the interest of the community that he should have it. The prosperity of the present irrigated areas came from the subdivision of the land and the consequent intensive cultivation. With an adequate supply of water, a farm of 5 acres in some parts of the arid West, or of 40 acres elsewhere, is as large as may be successfully tilled by one family. When, therefore, a man attempts to hold 160 acres of land completely irrigated by government work, he is preventing others from acquiring a home, and is actually keeping down the population of the State.

Speculation in lands reclaimed by the government must be checked at whatever cost. The object of the Reclamation Act is not to make money, but to make homes. Therefore, the requirement of the Reclamation Act that the size of the farm unit shall be limited in each region to the area which will comfortably support one family must be enforced in letter and in spirit. This does not mean that the farm unit shall be sufficient for the present family with its future grown children and grandchildren, but rather that during the ten years of pay-

*A letter from President Roosevelt to the Congress of Irrigation Engineers, held at Boise, Idaho, September, 1906.

ment the area assigned for each family shall be sufficient to support it. When once the farms have been fully tilled by freeholders, little danger of land monopoly will remain.

This great meeting of practical irrigators should give particular attention to this problem and others of the same kind. You should, and I doubt not that you will, give your effectual support to the officers of the government in making the reclamation law successful in all respects, and particularly in getting back the original investment; so that the money may be used again and again in the completion of other projects and thus in the general extension of prosperity in the West. Until it has been proved that this great investment of $40,000,000 in irrigation made by the government will be returning to the Treasury, it is useless to expect that the people of the country will consider direct appropriations for the work. Let us give the Reclamation Service a chance to utilize the present investment a second time before discussing such increase. I look forward with great confidence to the result.

By the side of the Reclamation Service there has grown up another service of not less interest and value to you of the West. This is the Forest Service, which was created when the charge of the forest reserves was transferred from the Interior Department to the Department of Agriculture. The forest policy of the Administration, which the Forest Service is engaged in carrying out, is based, as I have often said, on the vigorous purpose to make every resource of the forest reserves contribute in the highest degree to the permanent prosperity of the people who depend upon them. If ever the time should come when the western forests are destroyed, there will disappear with them the prosperity of the stockman, the miner, the lumberman, and the railroads, and, most important of all, the small ranchman who cultivates his own land. I know that you are with me in the intention to preserve the timber, the water, and the grass by using them fully, but wisely and conservatively. We propose to do this through the freest and most cordial coöperation between the government and every man who is in sympathy with this policy, the wisdom of which no man who knows the facts can for a moment doubt.

It is now less than two years since the Forest Service was established. It had a great task before it—to create or reorganize the Service on a hundred forest reserves and to ascertain and meet the very different local conditions and local needs all over the West. This task is not finished, and of course it could not have been finished in so short a time. But the work has been carried forward with energy and intelligence, and enough has been done to show how our forest policy is working out.

The result of first importance to you as irrigators is this: The Forest Service has proved that forest fires can be controlled, by controlling them. Only one-tenth of 1 per cent of the area of the forest reserves was burned over in 1905. This achievement was due both to the Forest Service and to the effective assistance of settlers and others in and near the reserves. Everything the government has ever spent upon its forest work is a small price to pay for the knowledge that the streams which make your prosperity can be and are being freed from the ever-present threat of forest fires.

The long-standing and formerly bitter differences between the stockmen and the forest officers are nearly all settled. Those which remain are in process of settlement. Hearty coöperation exists almost everywhere between the officers of the Forest Service and the local associations of stockmen, who are appointing advisory committees which are systematically consulted by the Forest Service on all questions in which they are concerned. This most satisfactory condition of mutual help will be as welcome to you as it is to the Administration and to the stockmen. To the stockmen it means more, and more certain, grass; to you, because of the better protection and wiser use of the range, it means steadier stream-flow and more water.

The sales of forest-reserve timber to settlers, miners, lumbermen, and other users are increasing very rapidly, and in that way also the reserves are successfully meeting a growing need.

Lands in the forest reserves that are more valuable for agriculture than for forest purposes are being opened to settlement and entry as fast as their agricultural character can be ascertained. There is therefore no longer excuse for saying that the reserves retard the legitimate settlement and development of the country. On the contrary, they promote and sustain that development, and they will do so in no way more powerfully than through their direct contributions to the schools and roads. Ten per cent. of all the money received from the forest reserves goes to the States for the use of the counties in which the reserves lie, to be used for schools and roads. The amount of this contribution is nearly $70,000 for the first year. It will grow steadily larger, and will form a certain and permanent source of income, which would not have been the case with the taxes whose place it takes.

Finally, a body of intelligent, practical, well-trained men, citizens of the West, is being built up—men in whose hands the public interests, including your own, are and will be safe.

All these results are good; but they have not been achieved by the Forest Service alone. On the contrary, they represent also the needs and suggestions of the people of the whole West. They embody constant changes and adjustments to meet these suggestions and needs. The forest policy of the Government in the West has now become what the West desired it to be. It is a national policy—wider than the boundaries of any State, and larger than the interests of any single industry. Of course it can not give any set of men exactly what they would choose. Undoubtedly the irrigator would often like to have less stock on his watersheds, while the stockman wants more. The lumberman would like to cut more timber, the settler and the miner would often like him to cut less. The county authorities want to see more money coming in for schools and roads, while the lumberman and stockman object to the rise in value of timber and grass. But the interests of the people as a whole are, I repeat, safe in the hands of the Forest Service.

By keeping the public forests in the public hands our forest policy substitutes the good of the whole people for the profits of the privileged few. With that result none will quarrel except the men who are losing the chance of personal profit at the public expense.

Our western forest policy is based upon meeting the wishes of the best public sentiment of the whole West. It proposes to create new reserves wherever forest lands still vacant are found in the public domain, and to give the reserves already made the highest possible usefulness to all the people. So far our promises to the people in regard to it have all been made good; and I have faith that this policy will be carried to successful completion, because I believe that the people of the West are behind it.

THE HIGHEST CAMP IN THE WORLD

MR. HARRINGTON PUTNAM, of New York, sends the following extract from a letter from Mrs Fanny Bullock Workman, who has been making some marvelous mountain ascents in the Himalayas:

"We have just finished a journey to the Nun Kun range, southwest of Ladakh, with six Italian porters and the guide, C. Savage, of Courmayeur. He was with us in 1903 and refused the offers of the Duke for Rumenzori, to go with me. It was my expedition, Dr Workman only deciding to go as my guest at the last moment. We made the first circuit of the range, 90 to 100 miles, over 40 miles of glaciers never before visited. I with Savage and one porter ascended one of the three highest Nun Kun peaks—survey measurement, 23,260 feet—and thus

can for a moment claim world record with men until some one goes higher. Dr Workman went to 22,650 feet. We camped higher than any one has yet camped, highest camp being 19,899 feet, 20,632 feet, and camp America 21,300 feet! All of us conquered two other virgin snow peaks of 18,743 feet and 20,168 feet and four snow columns from 16,500 to 17,300 feet. My idea was to have European porters carry all camp kit after coolies gave out, and this they did successfully from the third camp on. There was chance for observing the effects of rarefied air, and we found insomnia our greatest difficulty. No one slept more than a very few minutes at a time at our three last camps. Our lowest minimum temperature at Camp America was —6° F., and it was bitter in a Mummery tent. This is my last trip, I suppose, but it was glorious and I hate to leave the Himalayas. We climbed well above the Duke, did we not?"

ANNOUNCEMENT

ON another page is printed the program of addresses before the National Geographic Society during the season of 1906–1907, practically all of which will be published in this Magazine during the coming year. In our December number we shall publish a series of illustrations of "The Greatest Hunt in the World"—the drive of wild elephants in Siam—with an article by Miss Eliza R. Scidmore, Foreign Secretary of the National Geographic Society. The same number will contain the address of Hon. John W. Foster, formerly Secretary of State and chairman of the Chinese Delegation to The Hague, on "The New China"; the address of Dr A. P. Davis, Assistant Chief Engineer, U. S. Reclamation Service, on "The Great New Lake in Southern California made by the Colorado River," which has at last been reduced to control again, and also the address, "Colombia—a Land of Great Possibilities," by Hon. John Barrett, U. S. Minister to Colombia.

RECENT MAGNETIC WORK BY THE CARNEGIE INSTITUTION OF WASHINGTON

Magnetic Survey of Pacific Ocean.—The yacht *Galilee,* under the command of Mr W. J. Peters, successfully concluded a cruise of 20,000 miles, leaving San Diego March 2 last and returning October 20. The following region was embraced, as indicated by the ports of call, namely: Fanning Island, Samoan Islands, Fiji Islands, Marshall Islands, Guam, Yokohama, San Diego. Mr Peters' assistants were Mr J. P. Ault and Mr J. C. Pearson, magnetic observers, and Dr H. E. Martyn, surgeon and recorder, Captain J. T. Hayes being the sailing master, as in the cruise of 1905. In all thus far the magnetic elements have been charted over about half of the North Pacific Ocean during the two cruises of 1905 and 1906. The vessel is expected to leave early in December on a third cruise beginning at San Diego and touching at the following ports: Marquesas Islands, Tahiti, Apia, Yap, Shanghai, Hongkong, Yokohama, Dutch Harbor, Sitka, and returning to San Diego.

Land Magnetic Work.—Dr Charles K. Edmunds, professor of physics at Christian College, Macao, China, determined the three magnetic elements (declination, dip, and intensity) at a number of stations along the Chinese coast. In the South Pacific Ocean, observations were made on various islands by Mr G. Heimbrod. In Canada the magnetic elements were determined by Dr L. A. Bauer and Messrs P. H. Dike and E. H. Bowen at 70 stations, distributed uniformly between the parallels of 42° and 49° and the meridians of longitude 65° and 105° west; in this region but comparatively few observations existed. With the completion of the latter work it is now possible to extend the magnetic maps for the United States to the forty-ninth parallel across the continent. The United States Coast and Geodetic Survey has in preparation a new set of magnetic maps based upon all accurate data obtained to date.

PROGRAM OF MEETINGS OF THE NATIONAL GEOGRAPHIC SOCIETY, 1906-1907

The completed program of the popular and technical meetings of the National Geographic Society for 1906–1907 is given below.

The annual banquet of the Society will be held December 15, at the New Willard, Washington, D. C. It is hoped that many members from neighboring cities will attend.

The Library of the Society is open to members during office hours. The Society is receiving the geographical, scientific, and popular periodicals, and has a considerable number of useful geographical books.

THE POPULAR COURSE

The general subject of the popular course of addresses for 1906–1907 will be "Pan-America."

The addresses in this Course will be delivered in the National Rifles Armory, 920 G street, at 8 p. m., on Friday evenings of the following dates.

November 9—"Colombia—a Land of Great Possibilities." By Hon. John Barrett, U. S. Minister to Colombia. Illustrated.

November 16—"Digging the Ditch." By Dr Willis Fletcher Johnson, Associate Editor of the New York *Tribune* and author of "Four Centuries of the Panama Canal." Illustrated.

This will be a popular account of the greatest engineering feat of all ages, with a description of the Republic of Panama and of the Panamans.

November 30—"Beautiful Ecuador." By Hon. Joseph W. Lee, U. S. Minister to Ecuador. Illustrated.

December 7—"The New China." By Hon. John W. Foster, formerly Secretary of State and Chairman of the Chinese delegation to the Hague.

December 14—"Russia and the Duma." By Mr William E. Curtis. Illustrated.

December 21—"Our Immigrants: Where They Come From, What They Are, and What They Do After They Get Here." By Hon. F. P. Sargent, Commissioner General of Immigration. Illustrated.

January 4—"Camping Expeditions in the Canadian Rockies." By Mr Howard Du Bois.

January 18—"The Guianas." By Prof. Angelo Heilprin, of Yale University. Illustrated.

Very little is known about this fascinating section of South America—one of the most beautiful and luxuriant regions of the globe.

January 19 (Saturday)—"Two Thousand Miles in the Saddle Through Colombia and Ecuador." By Hon. John Barrett, U. S. Minister to Colombia. Illustrated.

January 25—"Bolivia—a Country Without a Debt." By the Bolivian Minister, Señor F. Calderon. Illustrated.

February 1—"The Rising Pacific Empire." By Hon. George C. Perkins, U. S. Senator from California.

February 8—"An American in Cuba." By Mr Walter D. Wilcox. Illustrated.

Mr Wilcox is well known to members of the National Geographic Society because of his previous wonderfully illustrated lectures on the Canadian Rockies. For the past two years he has been living in Cuba, where he is interested in a mahogany forest.

February 9—"A Trip to Argentine and Paraguay." By Mr John W. Titcomb, of the U. S. Bureau of Fisheries. Illustrated.

Mr Titcomb was recently invited by the Argentine government to investigate the fisheries of the republic and to recommend a plan for their improvement. He spent nearly a year in Argentine and Paraguay, engaged on the work, which gave him special opportunities of seeing the people and country.

February 15—"Ten Years of Polar Work; or, What we Know and What we Want to Know." By Mr Herbert L. Bridgman, Secretary of the Peary Actic Club. Illustrated.

March 1—"Santo Domingo and Haiti." By Rear Admiral Chester, U. S. Navy. Illustrated.

March 15—"The Regeneration of Korea." By Mr George Kennan. Illustrated.

March 23—"Queer Methods of Travel in Curious Corners of the World." By Hon. O. P. Austin, Chief Bureau of Statistics. Illustrated.

March 29—"Mexico—the Treasure-house of the World." Illustrated.

April 5—"A Popular Explanation of Earthquakes and Volcanoes." By Dr G. K. Gilbert, of the U. S. Geological Survey. Illustrated.

April 12—"Captain John Smith and Old Jamestown." By Mr W. W. Ellsworth, Secretary of the Century Co.

The approaching Jamestown Exposition adds special value to this lecture, which will be illustrated with 150 stereopticon views of the famous colonial homes on the James river, of photographs connected with Captain John Smith, and of all the pictures that bear on the Pocahontas story.

Announcements will be made later of addresses by Commander Robert E. Peary, U. S. Navy, who has recently attained "Farthest North," and by Dr F. A. Cook, of Brooklyn, who has accomplished the first ascent of Mount McKinley, the highest mountain in North America.

SCIENTIFIC MEETINGS

The meetings of this course will be held at the home of the Society, Hubbard Memorial Hall, Sixteenth and M streets, at 8 p. m., on the following dates:

November 10 (Saturday)—"Prosperous Porto Rico." By Hon. William F. Willoughby, Treasurer of Porto Rico.

November 23 (Friday)—"The Great New Lake in Southern California made by the Colorado River." By Dr A. P. Davis, Assistant Chief Engineer, U. S. Reclamation Service. Illustrated.

December 10 (Monday)—"Agricultural Progress in the United States." By Hon. Willett M. Hays, Assistant Secretary of Agriculture. Illustrated.

December 17 (Monday)—"Enterprising Siam." By Mr Henry S. Kerr, of New York, who has recently returned from that distant land. Illustrated.

December 28 (Friday)—"Acclimatizing Fishes—or Transplanting Fishes from the Atlantic to the Pacific, and Vice Versa, etc." By Dr Hugh M. Smith, Deputy Commissioner, Bureau of Fisheries. Illustrated.

January 11 (Friday)—"Annual Meeting. "Aboriginal Agriculture in Guatemala." By Mr O. F. Cook, of the U. S. Department of Agriculture. Illustrated.

January 16 (Wednesday)—"The U. S. Forest Service." By Mr Gifford Pinchot, Forester. Illustrated. The Forest Service has charge of 114,606,058 acres of forest land, worth $400,000,000.

January 22 (Tuesday)—"The Coal Lands of the U. S. Public Domain." By Mr M. R. Campbell, of the U. S. Geological Survey. Illustrated.

February 9 (Saturday)—"A Visit to Sumatra." By Mr George H. Peters, of the U. S. Naval Observatory. Illustrated.

February 18 (Monday)—"Reclaiming the Desert." By Mr C. J. Blanchard, of the U. S. Reclamation Service. Illustrated. The Reclamation Service has a fund of $40,000,000, which is being invested in irrigation works.

February 22 (Friday)—"Reclaiming the Swamp Lands of the United States." By Mr H. M. Wilson, of the U. S. Geological Survey. Illustrated.

March 8 (Friday)—"Twenty Years in Beirut and Damascus; or, The Syria of Today." By Rev. F. E. Hoskins. Illustrated.

March 22 (Friday)—"Utilizing the Surface Waters of the United States for Power." By Mr H. A. Pressey, C. E. Illustrated.

April 6 (Saturday)—"The South Sea Islanders." By Mr A. B. Alexander, of the U. S. Bureau of Fisheries. Illustrated.

April 15—"Photographs of Wild Game Taken by Themselves." By Hon. George Shiras, 3d. Illustrated.

April 19 (Friday)—"The Bureau of American Republics." By Hon. W. C. Fox, Director of the Bureau of American Republics.

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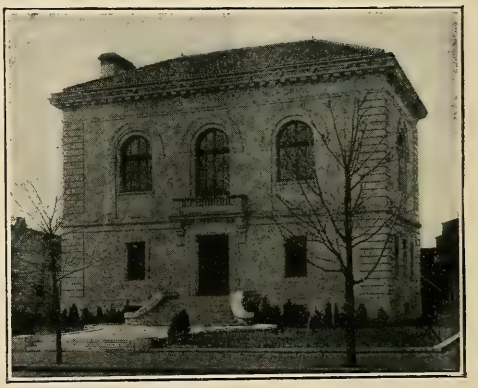

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Vol. XVII DECEMBER, 1906 No. 12

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Formerly U. S. Secretary of State

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By ELIZA RUHAMAH SCIDMORE

Foreign Secretary of the National Geographic Society, Author of "Winter India," "China—the Long-lived Empire," "Jinrikisha Days in Japan," "Java, the Garden of the East," etc.

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(Illustrated)

By Hon. JOHN BARRETT

U. S. Minister to Colombia

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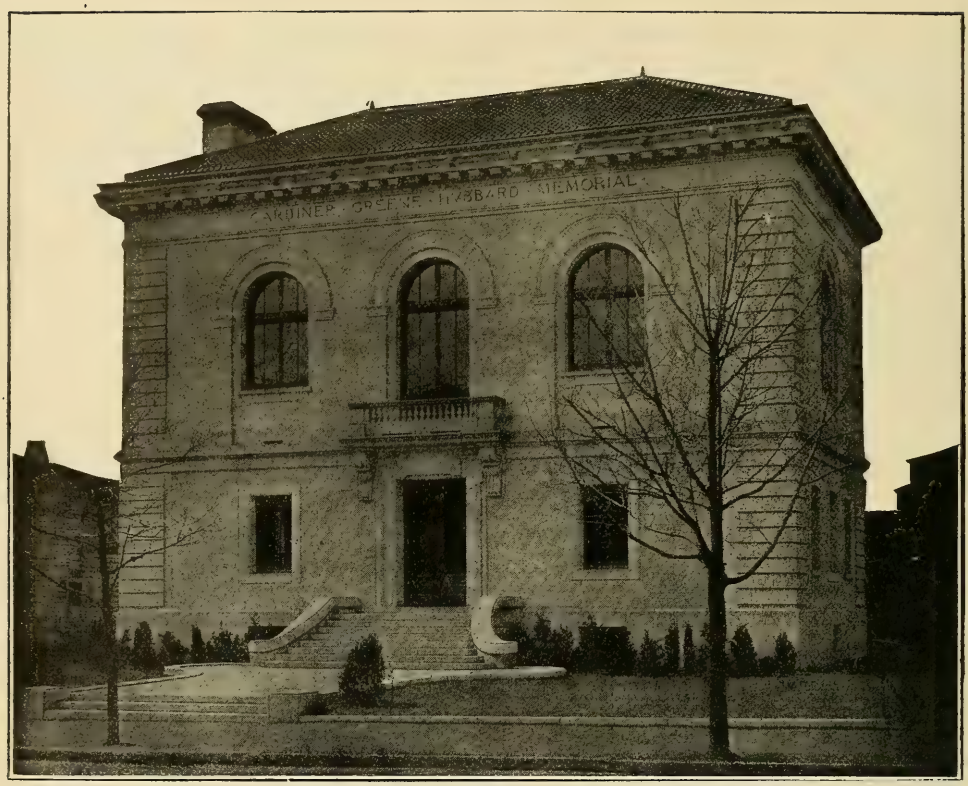

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THE NATIONAL GEOGRAPHIC MAGAZINE

PRESENT CONDITIONS IN CHINA*

BY HON. JOHN W. FOSTER

FORMERLY U. S. SECRETARY OF STATE

IN a previous course of addresses given under the auspices of the National Geographic Society I had the privilege of speaking upon the Chinese Empire, its people and government. At that time I dwelt mainly upon its long history, its great achievements in the past, and its valuable contribution to the philosophy, science, invention, and industries of the world. I have been asked to speak at this time upon the present conditions in that Empire.

In my former address† it was seen that the ruling spirit which characterized this great people, numbering approximately one-fourth of the world's population, was an intense conservatism. They were justly proud of the achievements of their race, and were wedded to the principles and customs which had built up and perpetuated their Empire. They looked upon the innovations which were sought to be introduced through western civilization with a feeling of fear and aversion. Their intercourse with the nations which were the champions of this western civilization created at first suspicion, which at last ripened into hostility. The Europeans who sought intercourse with them manifested a disposition to gain their end by violence, culminating in a succession of wars, in which China was invariably worsted. The wars were attended or followed by enforced treaties, in which territory was surrendered to the Europeans; foreign settlements were established in almost every available port within the Empire, wherein the imperial government gave up a part of its sovereignty; its right to fix its customs tariff and regulate its foreign trade was taken from it; its treasury was despoiled by vast indemnities for exaggerated damages exacted under duress of arms; and in various other ways its sovereignty was infringed and its independence restricted.

A NEW ERA IN CHINA

Under such circumstances it was perfectly natural that a feeling of resentment against foreigners should pervade the Empire. But the Chinese are an eminently practical people. Despite their pride of race and their conservatism, they have come to realize that the nations which have enforced this unwilling in-

*An address to the National Geographic Society, December 7, 1906.
†Published in the National Geographic Magazine, December, 1904.

tercourse and deprived them of so many of the attributes of sovereignty possess elements of power and prosperity which they do not enjoy. It has at last become apparent to them that the system, venerated for its antiquity, which has made of them a great and enduring race, must in the light of modern civilization be so modified in its social, industrial, and governmental features as to enable them to compete with the western nations in prosperity, power, and independence.

Hence a new era has dawned upon China. It shall be my purpose to show the steps which have been and are being taken by its government and people to bring them abreast of modern progress, and to enable them to take their proper place among the nations of the earth—a place which the vision of a political seer might fix in the van of all the nations.

Probably the most distinguishing characteristic of this ancient Empire and people has been their intellectual development and education. In the first epoch of even their prehistoric age their study of philosophy was noted, and centuries before Christ they had produced in Confucius and Mencius philosophers who stand on a level of intellectual attainments with Socrates and with the best products of ancient or modern times. We shall see that they possessed a code of laws and system of jurisprudence at least contemporaneous with Hammurabi and many centuries before Justinian. For nearly two thousand years they have made scholastic attainments the first requisite to admission to the public service, and schools under the patronage of the government have for many centuries existed in every province and district of the Empire.

THE REFORM IN EDUCATION

But the curriculum of education was confined to Chinese subjects—to a study of its classics, its history, poetry, system of government and society. Up to a very recent date an educated Chinese knew little or nothing of the outside history of the world, its philosophy or literature, its science or economics. As a result, they ranked abroad as an ignorant race, and their public men, although possessed often of superior intellectual endowments, stood at a great disadvantage in their intercourse with foreign governments and in commercial affairs.

Besides, education was confined to a limited class of the people—to those who were seeking admission to the public service or to what were known as the literati or gentry of the community. The great mass of the population were uneducated, being unable to read or write, and almost entirely ignorant of the world beyond, although possessed of a knowledge of their local rights, with a disposition to assert them. To this ignorance was added a blind superstition, which influenced their every-day life and especially their intercourse with foreigners.

It became evident, not only to the rulers, but to the intelligent people, that China could never attain her true position among the nations until a radical change was made in its educational system. First, the course of study must be entirely changed, the old method of an exclusive instruction in Chinese studies be given a subordinate place, and the modern course, or what is known as the western learning, assigned to the prominent position; second, the schools must not be confined to the literati and aspirants for office, but extended to the common people as fully and as rapidly as possible.

Following this program, a great change has taken place in the last few years. Intelligent viceroys like Chang Chih-tung and Yuan Shih-kai did not wait for an imperial initiative from Peking, but upon their own authority they entered upon the work of establishing schools of western learning. Other viceroys and governors, inspired by their example, fell in with the movement, and the authorities in the prefectures and districts are striving to meet the popular demand for the new schools; so that the movement has spread rapidly throughout the entire Empire, and there is not a single one of the

eighteen provinces in which the new system has not been established.

The metropolitan province of Chihli, feeling the new inspiration of the court, has done most in this direction. In Peking the new schools are rapidly increasing, and in the adjoining district of Tung Chou alone as many as ninety are reported. Under the special direction of the Viceroy Yuan Shih-kai, more than three thousand have been opened in the province and are in operation. A similar condition exists in the provinces under the sway of the venerable Viceroy Chang Chih-tung. At Nanking, the ancient capital and the seat of an important viceroyalty, the new learning has been warmly received. It will indicate something of the interest shown in this direction when I mention that a Japanese gentleman, described as "of forceful personality and scholarly attainments," who is now on a visit to the leading cities of China to explain to her students and scholars the secret of Japan's wonderful progress, a few weeks ago delivered a series of lectures at Nanking which were attended by five hundred students of the collegiate institutions there. It is reported that he eloquently set forth patriotism, a broad-minded willingness to learn, and the sense of individual rights as the secret of what Japan has done and urged the Chinese to follow in the same path.

This educational movement is not confined to the ordinary common schools and colleges, but in various of the provinces there are being founded normal and agricultural institutes, manual-training schools, schools for mechanical engineering, electricity, use of modern machinery, and the like. In most of the schools physical exercise has been introduced, a complete innovation for the Chinese, and the branch of western civilization exemplified in base and foot ball, cricket, &c., is heartily welcomed by them.

SCHOOLS FOR GIRLS INAUGURATED

The most gratifying feature of the new movement is the readiness with which the Chinese have accepted schools for girls and the rapidity with which female education, hitherto unknown, has spread throughout the country. The Empress Dowager set the example by ordering that a large Lama convent be transformed into a girls' school, and several princesses have undertaken to establish such schools at their own expense in Peking, and besides have started schools in their own palaces for their daughters and their relatives. There are now in Peking a number of public girls' schools in which are taught arithmetic, geography, foreign history, and languages, and in many of them music, drawing, calisthenics, needlework, writing, physiology, hygiene, and nursing. By an order of the board of education, no pupils whose feet are bound are admitted to these schools. As indicating the advance in female education, a project is being carried into effect by Yuan Shih-kai to establish a female medical school.

Tuan Fang, who was a member of the imperial commission which visited the United States and Europe early in the present year, has on his return to Peking awakened a new interest in female education by the report of his observations, especially in the United States, which led the board of education to take measures, it is stated, to push ahead female schools throughout the Empire without any further procrastination. Tuan Fang's idea is that graduates of female high and normal schools may be put in charge of primary schools, and, with a constantly growing number of educated women, children will have in the near future the valuable privilege of a mother's teaching at home, the real school for patriots. None, he says, are greater patriots and more loyal to a government than women.

THE LITERARY EXAMINATIONS, CENTURIES OLD IN PRACTICE, HAVE BEEN ABOLISHED

After the schools of modern learning had been established all over the Empire, the important question arose what was to become of the literary examinations, through which admission was obtained

to the public service. For many centuries the competitive examinations, hoary with age and venerated by the literati and the great mass of the officials, had been the road to imperial honor and office. If that system was to continue it was plain that the progressive men of the Empire would not be able to make the spread of modern education a permanent success. Hence in 1905 an important step was taken by them. Six of the most influential officials, together with others, joined in a memorial to the throne to abolish the ancient curriculum of studies and adopt a new one for the competitive examinations, which would embrace the modern learning as taught in the new schools. At the head of these was Chang Chih-tung, described by Minister Rockhill as the most celebrated living scholar in China; next came Yuan Shih-kai, the most powerful man today in the Empire, and four others, the more important viceroys and governors of provinces. It was an array of names which indicated in a most impressive way the strong hold which the reform movement had taken upon the country. Although the memorial was stoutly opposed by the conservatives in the Court circle, it was approved by the Emperor and Empress Dowager and an edict was issued abolishing the old curriculum of study and the new system adopted. Henceforth no one can pass the competitive examination who has not pursued with success the required course in modern learning.

The importance of this step can hardly be exaggerated. It was the culmination of a bitter contest for reform; but its success does not indicate the end of the difficulties for the new education. The greatest defect of the movement is that it has no well-planned and methodical system, with the power and resources to support it. Its advocates recognize this, and a central board of education has been organized at Peking to meet this difficulty. Its task is attended by serious embarrassments. Its members are themselves in large measure ignorant of their duties, and unless they call in expert assistance they are likely to make grave mistakes. There are no funds at their disposal and resources have to be provided. These will come from taxation and voluntary contributions. The latter are being made with surprising liberality, both in the capital and in the provincial cities, in some instances as much as ten thousand taels being contributed by single individuals.

OFFERINGS TO THE DEAD PROHIBITED

It will indicate something of the earnest spirit which is enlisted in this educational movement if I give one or two instances of the methods resorted to for adding to the funds to sustain it. Within the present year the commissioner of police of Tientsin, a city of over a million of inhabitants, has issued an official notification prohibiting the holding of celebrations or making offerings to the dead on the great festival of All Souls. The commissioner strongly advises the people to contribute to the educational fund the money intended to be spent in offering sacrifices to the spirits; as, he says, "with a view of equipping themselves and their families for the exercise of electoral power."

In August last the Shanghai magistrate agreed to issue a proclamation, in response to the petition of the native educational committee and the commercial association, exhorting the people of that district to divert the large sums of money used during the three festivals for the dead to the vastly more worthy and practical object of endowing and establishing more schools of modern learning. An extract from the account of these festivals in the Shanghai *News* will show how appropriate is the official exhortation for the increase of intelligence among the Chinese people. It states that immense sums of money are expended by the votaries of the Taoist and Buddhist religions in Shanghai and everywhere in the Empire in the purchase of incense, candles, paper clothes and money to burn on the three festivals of the dead to the use of the inhabitants of the nether regions, who at that time are let out from hades to re-

visit the upper world. On those three days the tutelary diety of the city is carried out from his temple in solemn procession to preside over the public burning and the offering of food, "to keep order amongst the spirits and to preserve the peace amongst them." The diety is always accompanied by thousands upon thousands of devotees of all ages and sexes, in red clothes and disheveled hair, as condemned criminals, in return for some fancied answering of prayer. In addition, similar burnings and offerings of food are performed in the private houses. All of these cost the people of Shanghai, at a modest estimate, a quarter of a million of dollars; and to this there should be added $100,000 paid on these occasions to Taoist and Buddhist priests for prayers to the dead. The enlightened Chinese officials exhort their countrymen to give up their idolatrous practices and apply the money thus wasted to the more worthy work of educating the coming generation in their duties to sovereign and country.

BUT SPIRIT OF SUPERSTITION NOT YET OVERCOME

It is thus seen that one of the first effects of the educational movement is a blow at the superstitious practices, upon which vast sums of money are squandered. The financial embarrassment which retards the establishment of schools would be solved at once if the advice of the Tientsin and Shanghai officials was followed. Many will doubtless act upon the advice of the intelligent officials, but the spirit of superstition will not easily be overcome. The troubles which the new schools encounter may be illustrated by an incident which occurred a few months ago in one of the most populous provinces. At Kweilin a provincial college had been established, and its faculty, possessed of a zeal for the new learning, caused a school-house in foreign style to be built in an adjoining district, and it soon had a hundred students in uniform in attendance. In the district for two months there had been no rain during the growing season, and, the crops being threatened by the drouth, the country people joined in a procession to the temple to pray for rain. Now, in the province of Kwangsi it is thought to be most unpropitious if the procession of suppliants for rain should happen to meet any one clothed in white or wearing a hat. This procession on its way to the temple had to pass by the new school-house, and the boys came out to see the procession, wearing their white uniform and straw hats. This, combined with the foreign appearance of the school-house, caused angry murmurs to pass through the crowd, and very soon these culminated in a violent attack on the school and the students. Several were badly beaten and all who were caught had their white suits torn from their backs. The town magistrate intervened to restore order, but was himself severely handled and knocked down with a stone. Only the arrival of soldiers prevented greater damage. The crowd was dispersed, leaving the school-house in a dilapidated condition. The head-master and teachers were greatly frightened, "threw up their job," and fled to the provincial college.

"THE COMING OF THE CIGARETTE"

A correspondent in the same paper from which the foregoing is taken gives an account of an incident not entirely in line with the subject I am discussing, but it is illustrative of the new spirit of enterprise which is awakening the great Empire and in which certain American interests are taking an active part. Under the heading of "The coming of the cigarette" he writes:

"Nanking has at length, for the first time in its long history, fallen a victim to Western advertisement enterprise. Two agents of the American Tobacco Company recently spent two weeks in this city, and now about the gates of our two-thousand-year-old walls and on almost every other conspicious place one sees flaming advertisements of American cigarettes.

"The strangers seem also to have pre-

sented cigarettes with such lavish generosity to the man in the street that his suspicions have been aroused; he does not know what the hoped-for *quid pro quo* is, but feels sure that the motive was not philanthropy. A report was therefore started that the cigarettes were injurious, and that it was a wholesale attempt to poison the people. As a result, some public-spirited students prepared a number of posters which they pasted under the new advertisements, informing the people that the tobacco contained opium or morphia and warning them against smoking to their hurt. This is said to have neutralized the effect of the advertisements in the popular mind and given a temporary check to the cigarette trade."

A COMMON LANGUAGE FOR THE PEOPLE

Returning to the subject of education, another important benefit to result from the general system of schools throughout the Empire is to provide a common language for the people. There are many dialects in the different provinces, and on the seaboard especially between Shanghai and the southern border almost every district has its own dialect; so that it is often impossible for the inhabitants of adjoining localities to communicate with each other, except through the written language. The new regulations require the Mandarin dialect to be used in the instruction in all the government schools. Hence it may be expected that the coming generation, educated in the schools, will speak a common language, and this should greatly tend toward the consolidation of the Empire.

The croakers, mainly among the foreign residents, predict that what they term the educational craze will soon lose its force, that the inexperienced board of education at Peking will not be able to skillfully direct it, that the financial schemes will prove ineffective, and that there will be in time a return to the antiquated methods. The advocates and supporters of the new education are likely to encounter opposition and disappointment before their plans are fully successful, but I believe their hopes will be eventually realized. An intelligent observer, writing from the capital of the province of Fukien, says:

"The new education has struck this place with full force. The old schools have disappeared. Everywhere one meets boys in caps and uniforms, with school books under their arms. The books are as modern as their appearance, and they are of all ages from 7 to 8 years to past 30 years. There can be no successful reaction in China now. The new educational movement all through the provinces makes it impossible."*

CHINESE EDUCATED IN AMERICA BECOMING PROMINENT

About thirty years ago the Chinese government entered upon the project of sending boys selected from good families to be educated in the United States, several scores of them were placed in families and schools in New England, and the enterprise bid fair to assume very large proportions. Coincident with the demand from California for the exclusion of Chinese laborers, which led to the exclusion treaty of 1880, the conservatives in the government brought about a cessation of the movement. Those who were educated in this country returned to their native land, but they were not welcomed by the then ruling powers in the government. They were in great measure excluded from the public service, for which they were well fitted; but in late years many of them have been given prominent places in the government and are now most conspicuous in inaugurating and carrying forward the reform movements of the day.

One of the important and influential persons in Peking is Tang Shao-yi (or Tong Shon Tee), one of the American educated students sent to this country in

*An interesting report on the new educational movement, prepared by the intelligent Chinese Secretary of the American Legation, Edward T. Williams, will be found in Foreign Relations of the United States, 1905, p. 197.

1875. He is now a member of the Board of Foreign Affairs and the ruling spirit of that important body. He negotiated with Great Britain the new Tibetan treaty, and has recently been made one of the new customs board, having to do with both foreign and interior taxes. The Empress Dowager, to signalize her appreciation of his talent and services, has conferred on him a high rank, never before bestowed on any but Manchus of the highest order. Dr Morrison, the well-known correspondent of the London *Times,* in a late dispatch pays a high tribute to his capacity and uprightness.

Another of the American students of the seventies is the present Imperial Minister Plenipotentiary to the United States, Sir Chentung Liang Cheng. It is no flattery to say that the Chinese Empire has never before had so able a representative in Washington, a cultivated gentleman and one who appreciates the friendship and good will of the government and people of the United States. Others of the American students of that period are also filling high places in the Empire.

For the past twenty years the Chinese students in American schools and colleges have been numbered annually only by the scores when they might have been by the hundreds or even thousands. Until President Roosevelt issued his order in June of last year, putting an end to the harsh measures of the Immigration Bureau, it was almost impossible for a Chinese youth to secure admission to the United States to pursue his education. We can only conjecture what might have been the influence on the destiny of that great people if the practice of sending students to America by the Chinese government thirty years ago had not been discontinued.

FOREIGN DIPLOMAS WELCOMED

One of the influences which has deterred students from going abroad has been the practice of not crediting them with the education thus acquired, but of compelling them on their return to take up the antiquated Chinese studies and spend years in preparing to pass the competitive examination which was required for admission to the lowest ranks of the public service. An imperial edict, however, was issued last year which recognized the value of foreign education to Chinese officials by conferring on quite a number of students lately returned from Japan the examination degrees and appointing them at once to official positions. But a still more important step in this direction was taken two months ago. All Chinese holding foreign diplomas were invited by the board of education to submit themselves at Peking for examination in the subjects they had studied abroad, and similar examinations are to be held hereafter annually. A large number responded, of whom 42 were admitted, 23 with Japanese degrees, 17 with American, and one each with English and German. They were allowed to use either Chinese or a foreign language. The London *Times* correspondent reports that 9 were granted the degree of Chinese doctorate, 23 that of master of arts, and 10 were rejected. It is interesting to note that of the 9 doctors 8 had studied in the United States, the highest being a graduate of Yale, and it is reported that "those who had studied in the United States proved themselves superior to all the others." The successful candidates were to have the high honor of being received by the Emperor, and their way is opened to the government service. It is gratifying to learn that graduates of the mission colleges in China were admitted to these examinations.

These measures and the encouragement of the imperial and provincial governments to study abroad have given a great impetus to the exodus of Chinese students to foreign lands. The imperial government has directed that the students in the different countries be placed under the care of the respective diplomatic representatives, and in execution of this duty Sir Chentung Liang Cheng assembled all the Chinese stu-

dents in the United States in a conference at Amherst, Massachusetts, last summer, and three days were passed in comparing experiences and in considering the best methods of making their stay abroad most useful to their country.

A WOMEN'S DAILY NEWSPAPER, EDITED BY WOMEN

Not the least of the agencies which have brought about the new educational movement has been the rapid multiplication of vernacular newspapers in China. An old resident of the country, in commenting upon this innovation, writes that five years ago a man seen reading a newspaper was ridiculed as a follower of the foreign devils. Now they are published in every important town in the Empire and are widely read by the people. Today there are ten native daily newspapers published in Peking alone. One of these is a women's daily, edited by women, dealing with foreign and domestic news, politics, history, geography, astronomy, as well as the training of children and the care of infants. The introduction of women into the body politic is one of the most astonishing features of the present awakening. Our minister in communicating the details of the boycott of American goods last year to the State Department transmitted the fact that one of the largest mass meetings in Shanghai to encourage the boycott was held in the Wupen girls' school, and that it was attended "by a large number of Chinese ladies, both old and young, who followed with intelligent interest the speeches that were made at the meeting."

REVISING A CODE 2000 YEARS OLD

The revision which is now going on in the Chinese penal code is one of the most important of the reforms which have been recently instituted, for it tends to the accomplishment of two very desirable results—first, the relief of the people from the ancient cruel and barbarous punishments; and, second, the eventual release of the country from subjection to the very irritating practice of exterritoriality.

We are accustomed to look upon the Chinese system of jurisprudence as crude and almost barbaric. The oft-repeated statement of foreign residents that there are no lawyers in the Empire and what we hear of the methods of administering justice confirm us in this opinion. But the fact is that the Chinese people have enjoyed for very many centuries the benefit of a well-digested code of laws, embracing in large measure the elementary principles of jurisprudence which distinguish the systems of law of the present day. Two thousand years ago the reigning Emperor caused the laws, which had been enforced in the Empire for centuries before, to be codified, and the compilation constituted forty volumes, each volume being devoted to a specified branch of law. Since then this code has undergone various changes, under different dynasties, but it has remained the fundamental structure of Chinese jurisprudence.

The code as it now exists was revised and published in 1647, three years after the present Manchu dynasty began its reign. The emperor in his preface to the publication states that a numerous body of magistrates was assembled at the capital to revise and digest the code, by the exclusion or introduction of such matter as "was likely to contribute to the attainment of justice and the general perfection of the work." When prepared, it was submitted to a select number of the great officers of state to carefully examine the whole. "Wherefore," says the emperor, "let it be your great care, officers and magistrates of the interior and exterior departments of our Empire, diligently to observe the same, and to forbear in future to give any decision, or to pass any sentence, according to your private sentiments, or upon your unsupported authority. Thus shall the magistrates and people took up with awe and submission to the justice of these institutions, * * * and be equally secured for endless generations in the enjoyment

of the happy efforts of the great and noble virtues of our illustrious progenitors."*

This later code, however, while preserving the enlightened principles which distinguished the ancient jurisprudence, was, we learn from the imperial edict of last year, disfigured and degraded by the introduction of the cruel and more severe punishments of the Manchus—a race more barbarous than the refined and enlightened Chinese. It is this portion of the code which has recently undergone radical modifications.

THE HORRIBLE METHODS OF CAPITAL PUNISHMENT ABANDONED

The forms of capital punishment heretofore in practice have been changed to simple decapitation and strangulation. They were horrible in their methods and largely based upon superstitious ideas of the future life. The execution by dismemberment was termed in Chinese "death by slicing," or "lingering death." The offender was tied to a stake or cross and the body gradually sliced beyond recognition. It is said, however, not to have been a lingering death, as the third cut was usually the fatal one. The purpose of this sentence was not so much the torture of the criminal in this world as to make his fate more dreadful in the world to come. As his body was unrecognizable here, so his spirit will be unrecognizable in the other world, unless the fragments of his body can be brought together again. This form of punishment was reserved for such heinous crimes as high treason, parricide, or the murder of a husband.

The punishment of "decapitation, with exposure of the head," was one degree more severe than simple decapitation. In the latter case the body is delivered to the relatives, who are permitted to have the head sewn on, so that the deceased may not wander headless in the land of shades. "Beheading the corpse" was the practice of carrying into execution the sentence of decapitation when the condemned had died in prison and been buried. Cases are cited where the body was exhumed and cut to pieces. Strangulation is regarded as less igonminious than decapitation, as there is no dismemberment.

Lesser forms of punishment have been branding on the arm or the face, applied to hardened criminals, which has been abolished; and corporal punishment by beating with the bamboo, which has been lightened.

It has been customary in the case of certain serious offenses to punish the relatives of a criminal as well as the criminal himself for his crime, as the Chinese law proceeded upon the assumption of the responsibility of the family for the acts of each of its members. It was an unjust procedure, but it often operated as a deterrent of crimes. This has been entirely abolished by the imperial edict.

EXAMINATION BY TORTURE AND INDEFINITE DETENTION IN PRISON ABOLISHED

It has been a common practice in the Chinese courts to examine the accused with the aid of torture. It is based upon the theory that the prisoner must acknowledge his guilt before he can be punished. The same practice has been resorted to respecting witnesses. All this has been done away with likewise. Steps have also been taken to put a stop to another serious abuse, the detention indefinitely in prison of persons charged with offenses and of witnesses alleged to be important for the conviction. Many have languished for years without a trial. It was a crying evil, especially in civil cases, as where a debtor was kept in prison until some settlement could be forced out of his relatives. The same word in Chinese is used for "prison" and "hell."

The places of confinement are said to be usually of the most wretched and filthy character. The imperial edict directs that a rigid and frequent inspection be made of them for the purpose of preventing unjust imprisonments and for

*For further examination, see Chinese in Law and Commerce, by T. R. Jernigan, 1905.

improving the condition of the prisons. The edict concludes with these words:

"Let each official be diligent in seeking the welfare of the people, and give earnest attention to the settlement of litigation, and so fulfill the purpose of the throne to have compassion upon the lowly and to lighten their punishments."*

The foregoing has been a somewhat gruesome narrative, but I have thought the recital necessary in order to show what a notable advance the Chinese government has made within the past two years in the criminal procedure of its courts. And yet it does not become us to be too severe upon these Orientals for the backward state of their methods of punishment, for it has not been many generations since the Christian nations emerged from a similar regime. William of Orange, the heroic defender of the Protestant faith, the ruler of one of the most enlightened and humane nations of modern times, was assassinated by a religious fanatic. Listen to the punishment inflicted by a judicial tribunal upon the murderer: He was condemned to have his right hand pressed in a case of red-hot iron; his arms, legs, and thighs torn with hot pincers; his chest cut open, his heart torn out and thrown in his face; the head severed from the body and stuck on a pike; the body quartered and each part placed over a gate of the city. Within a century, in England and America capital punishment was inflicted for a much longer list of and much less serious offenses than in China. Within the memory of many who hear me tonight imprisonment for debt was enforced in the United States. Happily for mankind the world around, we are living today in a better age, and China is seeking to take her place among the humane nations of the earth.

CHINA PLANS TO MAKE ITS COURTS SUITED TO FOREIGNERS

The other motive which has impelled the imperial government to this reform has been to place it more speedily in a position to follow the example of Japan and demand release from the exterritorial regime. Under this practice, as is well known, foreigners who by their acts in China subject themselves to criminal or civil litigation must have their cases tried before their own consul, as they are exempt from the jurisdiction of the Chinese courts. Besides, in all the important ports a foreign settlement is established with metes and bounds, within which Chinese sovereignty is not exercised as against the foreign municipality.

This is a condition which is very humiliating to Chinese pride and a source of much discontent, but it is a condition which must continue until the system of jurisprudence of the Empire is brought more nearly into harmony with that of the western nations, and its courts are so purified as to make it safe for foreigners to be subjected to their jurisdiction, with an assurance that justice will be administered fairly and free from corrupting influences. A long step has been taken in the direction of enfranchisement by the reforms which I have noted in the criminal procedure, but much still remains to be done. Japan had to wait for ten years, after it had entirely reformed its code so as to conform to the western system of laws and had completely reorganized its judiciary system, before the nations with which it had treaties consented to the abolition of the exterritorial regime.

THE NEW ARMY

For many generations China has been the least warlike of any of the great nations. Her most venerated philosopher and statesman, Confucius, taught its people that nations as well as individuals should settle their differences by appeals to right and justice. Consequently the soldier has occupied a low place in the social and political organization of the country. The tiller of the soil and the industrial classes have been preferred before him. But in the last century of

*For edicts and notes thereon, see U. S. Foreign Relations, 1905, p. 176.

intercourse with the Christian nations the Chinese have learned that another spirit and a different practice governs the affairs of mankind. They have seen that the blasphemous declaration of the greatest warrior of modern times, that God is always on the side of the heaviest battalions, governs the conduct, if not the belief, of Christendom.

They have been slow to learn this sad fact, but they have awakened at last to its reality. They did not reach this conclusion, however, until they had suffered the disastrous results of three unjust wars with European powers, and until an allied army, insignificant in numbers but powerful in modern armament, had twice invaded their territory and almost unopposed had seized the capital and dictated humiliating and oppressive terms of peace. The conduct of their comparatively small but warlike neighbor, Japan, in equipping itself with the latest methods and appliances of modern slaughter and overthrowing in armed conflict China's most dreaded foe was also a very impressive lesson.

The weakness of China, from a military point of view, has impressed strongly its rulers, and measures have been in progress for a few years past to create a numerous and powerful army, trained and equipped in the most advanced modern methods. Antedating the action of the central government, the two most advanced of the viceroys, Yuan Shih-kai and Chang Chih-tung, set to work to organize such armies, and great progress has already been made by them. In these two viceroyalties there are now not less than 150,000 soldiers, drilled and equipped on a modern military basis. Other viceroys and governors are following their example, and the imperial government is assuming the general control of all these forces, which will constitute in time an army rivaling in numbers, training, and outfit those of Japan and the military nations of Europe.

What is termed the Northern Army, under Yuan-Shih-kai, held manœuvers in the autumn of last year, which were attended by the foreign military attachés at Peking, and they reported with surprise that they had seen a formidable modern army, and that they had witnessed "a display momentous and epoch-making in the history of the Far East." Similar manœuvers were held in October last, in which divisions from the two armies took part. The London *Times* correspondent, in giving a report of these latter, says: "The general opinion formed at the manœuvers by the military attachés was not unfavorable, though many years' work * * * will be needed before the troops can claim equality with those of more advanced nations." It would seem that this great and populous Empire had at last laid aside its antiquated notions of right and justice, and had entered into the fierce competition of the Christian nations for preserving the peace of the world with vast armies and formidable navies.

FOREIGN ARMY CRITICISM

Some foreign military critics are inclined, however, to minimize the importance of this movement. They say that the making of an army is a matter of years; that a fighting instinct must be created and a patriotic spirit must be back of it, in both of which the Chinese race is deficient. Up to a recent period the literati, who give tone to public opinion, have looked down upon the fighting men, and it is questionable whether they do not still. Men of real influence in the army, they say, are rare and it lacks capable generals. Absolute integrity is necessary, and great corruption is known to have existed in the purchase of armament and supplies. There is no medical staff, the organization is weak in cavalry, desertion is rampant, and many other improvements are necessary before the Chinese can successfully meet a Japanese or a European army.

There is much truth in this criticism; but all of the difficulties cited may be overcome in time by persistency, of which the Chinese have an abundance, and by right methods, which they appear

to be applying as rapidly as possible. The military or army reorganization board at Peking is exercising supervision over the viceregal and provincial troops and giving cohesion to them, so that they will be in reality an imperial army. It has issued orders to have turned over to it all provincial arsenals and gun factories, a great step toward military centralization. A recent edict decrees that any official having to do with the purchase of arms and army supplies found guilty of dishonesty or accepting bribes shall be decapitated; and it is said that the frauds heretofore practiced by European armament agents are now almost impossible.

THE SOCIAL STATUS OF THE SOLDIER MADE EQUAL TO THAT OF THE CIVILIAN

The low grade of the military service has been noticed. In the past a marked difference has existed between the civil and military officers of the government. A civil mandarin, for instance, is exempt from corporal punishment in case of misdemeanors, while a military officer for such offenses can be sentenced to a number of blows with the bamboo. For these reasons Chinese parents have preferred to have their sons study for the literary degree, which opened to them civil official rank and title. In the reorganization of the official grades now going on, these distinctions are to be done away and the military officers to be placed on a status of equality with the civil mandarins.

Military officers as a class have been illiterate and many of them have risen from the ranks. These defects, it is expected, will in some measure be remedied by the general system of education of which I have spoken. But there have already been established military and naval schools in a number of provinces, and I learn from the report of Secretary Williams to the Department of State that it is proposed to establish in every province two grades of military and naval schools, and in Peking an imperial military college and also a naval college, students for which will be supplied from the provincial schools just named. In addition, the imperial board of education, with a view to inspiring in the rising generation a patriotic and martial spirit, has required military drill in all the government primary and grammar schools and the wearing of a uniform by all the students.

It must be admitted that the lesson, to which I have alluded, which the nations of our western civilization have with such severity taught the Chinese, that they can only enforce respect, protect their interests, and regain and maintain their sovereignty by force of arms, is in a fair way of being put into practical operation. If they can maintain their existence as a consolidated empire for a single generation longer, as they have for thousands of years, until their army is fully trained, equipped, and made efficient for war, and a navy commensurate with this imperial army built and put in hostile array, well may the nations which have despoiled them of their territory and treated their race with contumely and ostracism pray that they may return to the teachings of their great philosopher, who enjoined his followers to practice the spirit of the Golden Rule.

MANY RAILROADS BEING BUILT UNDER CHINESE INITIATION

Turning to a more agreeable phase of Chinese progress and reforms, the construction of railroads attracts our attention. When they were first sought to be introduced they met with intense opposition from the people, which forced the imperial government to temporize with the matter. An element of superstition entered into the question, and the disturbance of the ancestral tombs by the construction of the roads lent sympathy to the opposition. But business considerations also influenced the popular hostility. The Grand Canal, which was at the date of its construction the greatest commercial work ever undertaken, has of late years fallen much out of repair; but it still affords employment to a vast amount of capital and hundreds of thou-

sands of people. It was feared with much reason that the introduction of railroads would leave this capital and labor without employment.

But the construction of the railway lines from Peking to Tientsin and the Manchurian frontier and from Peking to Hankow has demonstrated their utility and that they will be profitable when wisely planned. The old opposition has given way, and the entire country seems seized with a strong desire to build railroads. Mr Hayes, the American consul at Nanking, in a report made in September last, states that 9,000 miles of such roads are in operation or under construction. He gives a detailed list of more than a score of railroads "which have been or are being built by Chinese initiative and under entire Chinese control."

Foreign interests in and out of China insist that the Chinese are not competent, without foreign direction and assistance, to build or operate railroads, and that neither native nor foreign capital in sufficient amounts will be forthcoming for such enterprises under native control. It is probable that such enterprises will encounter serious disappointments and undergo costly experiences, and that it would be better to have a participation of foreign skill and capital; but, if the Chinese desire and are ready to enter upon such experiments, I see no reason why they should not be allowed to do so, nor why such action on their part should be construed into a spirit of hostility to foreigners. It may be added that a race which constructed the Great Wall and the Grand Canal, two of the greatest engineering achievements of all time, should naturally have a laudable ambition to build their own railroads.

THE CIVIL ENGINEERS AND ALL RAILWAY OPERATORS ARE CHINAMEN

An intelligent American observer, who has spent the last few years in China and traveled extensively in the country, says: "I think it probable that during the next twenty years more miles of railway will be built in China than in any other part of the world; and while foreigners may assist in furnishing the capital, the prime movers will be the Chinese themselves, who will insist, as far as they are able, upon retaining substantial control." He adds, that the "Chinese are reaching the point where they can dispense with foreigners in operating their railroads. The entire northern division of the Imperial Railway of China had not, the last time I traveled over it, a single white employee."* Apropos of the ability of Chinese engineers for railroad construction, Mr Haynes, already cited, reports that the most difficult bridge, 2,300 feet long, on this line of 526 miles was built by a Chinese civil engineer, who graduated from the Sheffield Scientific School of Yale University.

A number of concessions have been granted to foreigners for lines of railroads, and they are now under construction, notwithstanding the desire of the natives to monopolize this class of improvements. The effect of the operation of all these lines of public traffic will be to stimulate trade, both domestic and foreign, make the inhabitants by intercommunication more intelligent and homogeneous, and greatly consolidate the Empire by bringing its remoter sections in rapid contact with the central government.

A CONSTITUTIONAL GOVERNMENT PLANNED

The reform movement in China which is attracting most attention abroad is the action of the imperial government looking toward the granting of a constitution and a representative assembly, or parliament. The step taken is very notable, but not so radical a departure from the existing regime as might be supposed. The government of China is an autocracy in form, but in few of the countries of the world is the spirit of democracy so manifest and potent. This has had a marked illustration in the changes which

*The New Far East, by Thomas F. Millard, 1906.

have taken place in the last few months in a number of the most important provinces, where at the popular demand viceroys have been removed and more acceptable ones appointed. In no other nation are the public offices so freely opened to the masses, as under the system of competitive examinations the lowest subject, with a few class exceptions, may fit himself for and obtain the highest office. There is no hereditary nobility, except of the imperial family. The Emperor recognizes himself and is recognized by his subjects as being controlled by a higher law than his own will. For many centuries the country has been governed by boards or departments at the capital, somewhat complicated, but similar in their operation to most of the political systems of the western nations. In more than one instance where the Emperor has gone contrary to the views of his advisers and the popular will he has been deposed and a new occupant of the throne chosen, who was more subservient to the established institutions of the Empire. The teachings of Confucius and Mencius, the highest Chinese authorities in governmental and social matters, were based upon the principle of securing the common good of all; hence a constitutional form of government might well be the legitimate offspring of the ancient order in China, independent of any aid rendered by modern civilization.

It is quite compatible, therefore, with the existing principles of government to take steps toward a more formal constitutional regime. But, as becomes a conservative people, these steps are being taken with deliberation. In the first place, an imperial edict was issued July 16 of last year, after many councils as to the reforms most needed by the country, appointing two commissions, composed of prominent and intelligent officials, to visit the United States and Europe. The edict stated that "the court has repeatedly announced in plain speech that earnest efforts must be made to introduce reforms, * * * with the view to raise China from her present condition of weakness and deliver her from the dangers into which she has fallen;" and the commissioners were commanded "to inquire into the methods of the various foreign governments, in the hope that we may be thus able to select and adopt the best."

We well remember the favorable impression made by the commissioners who recently visited Washington and other cities of the United States. The two traveling commissions (as they were called), having completed their investigations, returned to Peking in August last, had several personal audiences of the Emperor and Empress Dowager, and submitted their reports in writing, recommending the establishment of a constitutional government. These reports were the subject of earnest cabinet councils, in which the conservative element of the Court made determined efforts to defeat the constitutional plan, but they finally failed. It appears that Yuan Shih-kai, who was summoned to the capital from Tientsin, and Tuan Fang, the most efficient member of the traveling commissions, were the influential advocates of the constitution, and it is said won over the support of a large majority of the cabinet, as well as the Emperor and Empress Dowager.

A NOTABLE EDICT

As a result, the imperial edict was issued September 1 last, announcing the decision of the throne to grant and "adopt a constitutional system in which the supreme authority shall be vested in the crown, but all questions of government shall be considered by a popular assembly." The edict is a notable document, and I regret that I do not have the time to read it in full. It sustains the decision to adopt a constitution by citing the deplorable condition of the country which threatens danger and disaster, which can only be avoided "by broadening our knowledge, improving our laws, and keeping in the path of progress." However, before creating a constitution and a representative assembly, it says

several things must be accomplished. The existing official organization must be reformed and purified; education must be extended; the finances put in order; the military system improved, and the gentry and people made to understand political affairs. In a few years, when the system shall have been studied and outlined, a form of constitution will be announced and the date for putting it in operation fixed.

FOREIGN CRITICISM

It is somewhat discouraging to note that this great proclamation, although recognized as a memorable document, has met with severe criticism from foreign sources. The most intelligent and fair-minded of these critics to which I have access is the Shanghai *News*,* an English daily, which has devoted to it a number of recent editorials. Its chief criticism is that no time is fixed for announcing the constitution or putting the representative assembly in operation; that the preliminary work marked out may require ten or twelve years, or even a lifetime, and thus the promised reform be postponed indefinitely, as, it is alleged, the history of China for the last half a century has been largely a record of broken promises. It recognizes that it is a great ambition of a monarch to be the ruler of three hundred millions of united and prosperous people; that the granting of a constitution and parliament would increase their patriotic pride, while making them more serviceable to the throne, and if sincerely issued and carried out it would be the acme of shrewd statesmanship, but that the cry for reform seems to come from those who will not reform themselves.

The answer to the first part of this criticism may be found in the conduct of Japan. In the year 1869 the Mikado took what is termed the "charter oath," promising the give the people of Japan a deliberative assembly, and in the meantime to study the institutions of other countries; but not until 1881, twelve years later, did he fix definitely the period when the promised parliament would be convened, which was to be ten years later still, before which latter date he gave assurance that the constitution would be promulgated, and he warned his people that they should "hasten slowly toward constitutional and representative government." It is too true that very many of the ruling party in China who are opposed to the reforms inaugurated are unworthy and corrupt officials; but this fact is recognized in the edict from the throne and a determination is expressed to make an earnest effort to improve the methods and morals of public administration; and the critics must admit that the men who are directing the constitutional movement, such as Chang Chih-tung, Yuan Shi-kai, Tuan Fang, and Tang Shao-yi, are serious-minded men, and will compare favorably with the statesmen of other lands for uprightness and personal integrity.

Against them there cannot be brought the criticism that the reform comes from those who will not reform themselves. There is no doubt, however, that the most serious opposition to the constitution comes from the bureaucracy. This opposition among the high officials at Peking has been so strong that Prince Tsai Tseh, the head of the traveling commissions, felt it necessary a few weeks ago to address another memorial to the throne, in which he argues that "constitutional government is beneficial both to the state and the people, but most unbeneficial to the official classes." And he proceeds to condemn the lack of loyalty on the part of high dignitaries, who put their personal advancement before their duty to the country, and he warns their majesties against arguments springing from such selfish motives. After giving very forcible reasons in favor of a constitution, he closes with this significant statement: "If the throne does not grant the people their rightful privileges when they qualify themselves to enjoy them, they will un-

* Acknowledgment is made of indebtedness to the Shanghai *News* for many of the facts stated in this paper.

doubtedly try to claim them through illegitimate channels."

The criticism most strongly emphasized against the practicability of a centralized representative government is the present independent character of the viceroys and governors of provinces, who will be found unwilling to surrender their power. But it is to be remembered that these officials are not hereditary rulers like the Japanese daimios, but are appointed and removed at will by the imperial government, and the rule is that no one shall be appointed to a province of which he is a native or in which he has local attachments. If the viceroys are found to be resisting the policy of a constitutional regime, they may be removed and others more in harmony with the new policy appointed in their places.

WELCOMED BY THE PEOPLE

Let us turn from the foreign critics and see how the Chinese people have received the promised constitution. It is too early for reports from the interior provinces, but we have news from many of the great cities and centers of population. At Tientsin, Hankow, Nanking, Shanghai, Canton, and a number of other places a general holiday was declared, and the guilds, societies, and especially the schools and educational associations, united in processions and mass meetings, with patriotic addresses, and thanks telegraphed to the government at Peking, expressing their hearty appreciation of the act. It may be of interest to notice more in detail the action of the people of Canton, the most populous and wealthy city of the Empire, the farthest removed from the capital, and where it has been understood revolts and the anti-dynastic spirit are most rampant. The report states that a general holiday was arranged, business was suspended, and "the celebration called forth the loudest acclamations of rejoicing." The chamber of commerce took the lead, and was supported by the various guilds and societies. The shops and houses were gayly decorated, processions paraded the streets, with bands of music and fireworks, and the guild houses and public halls were crowded with people, who made their obeisances before the imperial tablets, bearing the names of the Emperor and Empress Dowager, as a mark of gratitude for the gracious acts of their majesties in proposing a constitutional government for the Empire.

Afterwards the crowds listened to patriotic songs from the students of the public schools and to addresses from prominent persons. In these the hearers were exhorted to use their best endeavors and influence toward the spread of modern education, without which the country never could understand the meaning of constitutional government and the responsibility therefrom which rested upon all, male and female; and they were warned that impatience and haste in trying to bring about such government would only ruin the hopes of those who were working for the welfare of the country. Telegrams were also sent to Peking, addressed to the princes and high ministers in charge of the reform measures, congratulating them on their important labors and asking them to convey to their imperial majesties the assurances of their most loyal devotion. It is reported from Peking that their majesties have manifested great pleasure in reading the accounts of these celebrations held in the principal cities of the Empire. With such a spirit animating the people, the editor of the foreign journal may well characterize the step as the acme of wise statesmanship.

THE OPIUM CRUSADE

The imperial government, not content with undertaking the important reforms which I have noticed in education, jurisprudence, industries, and politics, has also grappled with the great moral vice of its people—the opium habit. It has within the past hundred years become the crying social evil of the country, and it is a gigantic struggle which has been inaugurated for its eradication. No one who has not passed through the interior

of the country can appreciate the magnitude of the problem. It is said that nearly every family has felt the clutch of this monster vice, and it is known to have impoverished whole communities. It is, however, denied that the drug is largely used by the official class. A prominent mandarin of Peking, speaking from intimate knowledge of the matter, has stated that a very small percentage of high officials in Peking smoke opium, and that of all the viceroys and governors only one is addicted to the habit.

This fact gives greater hope for the enforcement of the edict which was issued on September 20 last, decreeing that steps be taken for the gradual suppression of the cultivation of the poppy and of the use of opium, and that both shall be completely abolished at the expiration of ten years. The edict declares that those addicted to the habit have wasted their time, neglected their trades, ruined their constitutions, and squandered their property; that for this reason China has become poorer and poorer every year; and it exhorts the people to stop the pernicious habit, pluck out the deep-seated cancer, and strive for an era of physical health.

Unfortunately it will be impossible to make the abolition of this devastating vice effective without the consent and cooperation of Great Britain. The result of what is known as the "Opium war" of 1840 secured the privilege to the British East India Company and their successor, the present government of India, to import opium into China. Frequent efforts have been made by China to have this privilege abolished, but it is a great source of profit to India, and the British government has steadily refused its consent. It is claimed that, as the poppy is much more largely produced in China than in India, so long as that is permitted in China it is a legitimate trade for India.

But there is a better prospect now than ever before to reach some agreement between the two countries. Mr John Morley, the secretary of state for India, a statesman of liberal and humane views, has announced in Parliament that the British government will go to the length of a financial sacrifice to assist China in any serious attempt to restrict the use of opium. Dr Morrison telegraphs the London *Times* that "every missionary in China, of whatever nationality, and the overwhelming mass of disinterested public opinion, both official and unofficial [British] will rejoice when the British connection with the traffic wholly ceases." The bishop of Hongkong is active in enlisting the coöperation of the British authorities. He asserts that twice the House of Commons has affirmed that this connection with the Indo-Chinese trade was wholly indefensible, and that the trade increased incalculably the misery of millions of their fellow-men and tended to the deterioration of a noble race.

It is a source of great gratification to state that the government of the United States is not only free from any connection with the trade, but that American citizens have from our earliest diplomatic connection with China been forbidden to engage in it. Both by treaty and diplomatic action, our influence has been thrown against it.

It is a stupendous undertaking on the part of the authorities to suppress this vice, which has taken such a strong hold upon the people. It may be compared to the ceaseless warfare that is being carried on in this country against intemperance. Among the first measures of the government is the prohibition of the use of opium in the new army and in the public schools and colleges, and instruction as to its evil effects. A late press telegram from Peking states that several officers of the old Manchu Banner Corps have been cashiered for smoking opium, that the officials in all the yamens, or government offices, at Peking have been ordered to break themselves of the habit within six months, and that an effort will be made to apply a similar rule to officials under sixty years of age throughout the Empire, on pain of dismissal from the service.

The people also seem to be responding in some measure to the appeals of the authorities by organizing anti-opium societies. The methods of the one in Canton will indicate the character of their efforts. The members of this society pledge themselves not to use opium, and to do all in their power to free others from its deadly grasp. They provide doctors and medicines to those making an effort to abandon the vice. They also organize street parades, in which men are dressed as confirmed opium sots, with most ragged and disreputable garments and their faces painted an ashy paleness familiar among confirmed smokers, thus exhibiting to the spectators "the awful example" of the opium fiend.

REFORMS IN DRESS AND FOOTBINDING

It would seem that the foregoing statement of the reforms undertaken in China would be sufficient to satisfy the demands of the most advanced advocates for its regeneration; but still other reforms are being urged upon the government and people. There are many who favor a change of the dress to the western style and the abolition of the queue by imperial edict. Changes in these matters are already in progress in the army and the public schools, and it is probable that they will be extended, as in Japan, without governmental interference. The abolition of slavery and polygamy is being strongly pressed. Neither of these practices has been widespread, and while from our western standpoint they are blots upon oriental civilization, the government may well be spared the burden of undertaking their abolition till the other important reforms it has in hand are in a more advanced stage of acceptance.

The movement for abandoning the custom of foot-binding is making progress, but it seems the most tenacious practice to be overcome. It has withstood more than one imperial edict, and the vast majority of the society women still cling to it as an evidence of refinement and fashion. The Empress Dowager seems determined upon its destruction, has recently issued a new fulmination against it, and is seeking to bring to bear official ostracism and the influence of the schools.

OBSERVANCE OF SUNDAY

The late announcement of Sunday as a legal holiday, when the public offices are to be closed, is not to be construed as a step toward the acceptance of Christianity, but is another evidence of conformity to western practices. Prince Pu Lun, a member of the imperial family, who visited our country two years ago as the Emperor's representative to the St. Louis Exposition, in answer to my inquiry as to what impressed him most in our country, said it was our weekly rest day, as in China they toiled on day after day without cessation. I have been told that one of the reasons for the step taken was that Sunday was a favorite day with western diplomats at Peking to visit the Foreign Office, the day when the officials of that department desired a vacation. Some color is given to that assertion when it is seen from the last volume of the Foreign Relations of the United States that the American minister is asking for an appointment on that day to visit the department on business.

Many parts of the country seem to have a rage for foreign ways and articles. A correspondent from the far-away interior province of Szechwan, on the confines of Tibet, writes: "I notice quite a number of the natives are wearing leather shoes made by local cobblers. What they want is a shoe that will polish and look like the foreigner's. In fact, they want everything to look like the foreigner's. They want hats like they wear in Shanghai; likewise their coats; they try to write with a lead pencil instead of a Chinese pen; they want foreign pictures for their shops. All this is a feeling after something different from their old ways of living. The next generation will want more luxuries than their fathers."

The American observer from whose book just published I have already quoted says: "It is not unusual to see wealthy Chinese going about in their motor cars,

driven by native chauffeurs. I saw the young daughter of a high official riding a bicycle through the street in a foreign concession, attended by a servant on another wheel. * * * Among nationalities none is today more disposed to take up new and improved methods than the Chinese."

CHINA FOR THE CHINESE

And yet during the past year and more the foreign press has been full of complaints that there exists in China a bitter hostility to foreigners, countenanced by the government and encouraged by the more intelligent and influential classes of the population. It is alleged that everywhere throughout the Empire the cry is "China for the Chinese," and that this means the exclusion of foreigners from all concessions and enterprises and from participation in the development of the country. To support these allegations the following, among other recent occurrences, are cited: The compulsory surrender of the Canton-Hankow Railroad concession, the Shanghai riot, the anti-American boycott, and the foreign customs supervision. Let us examine how far the facts sustain these allegations.

Much misinformation has been published respecting the repurchase of the Canton-Hankow Railroad. Only a few weeks ago so reliable a periodical as the New York *Independent* stated that the Chinese government had forced the repurchase in obedience to the demand of the Chinese Nationalists for the cancellation of all foreign concessions. The facts, briefly stated, are that out of special consideration for the United States the Chinese government granted to an American company in 1898 the most valuable franchise in its gift, a concession to build a railroad from Canton to Hankow, a distance with its branches of over 900 miles, through the most densely populated part of the country. As the government desired for political reasons that it should be an exclusively American enterprise, it inserted a provision in the contract that the ownership or control of the company should not be transferred to any other foreigners. After some years spent in vain efforts to raise the necessary capital in New York, the company did what it was expressly forbidden to do, sell a majority of the stock to Belgians, with what was believed to be the backing of China's most feared competitor, Russia. Besides, the representatives of the company by their overbearing conduct had incurred the hostility of the local authorities and people in China. Seven years passed without any serious effort to build the road, as only 32 miles had been constructed, and that merely a branch line. Under these circumstances the government gave notice to the company that it had forfeited its concession by reason of the sale to the Belgians, but that it was prepared to repay all the expenditures of the company. The latter then alleged it had bought back the control from the Belgians; but it was too late to re-establish itself in the confidence of the people of the provinces, and by a friendly arrangement the Government paid to the company three times the amount of its total expenditures and received a surrender of the concession.

There is a concurrence of testimony of American observers on the ground that the company by its bad conduct and unbusinesslike methods had forfeited all consideration. Hon. William E. Curtis, during a recent visit to China, wrote: "The famous American-China Development Company [the Canton-Hankow Railroad Company] has made a wretched mess of its concession and has dragged the honor and credit of American capitalists across about 700 miles of Chinese mud and dust."

Mr McCormick, the agent of the Associated Press during the Russo-Japanese war, just returned from China, in a recent article in the New York *Outlook*, says that the company clearly broke its faith with the Chinese government, and that its conduct, more than any other fact of our intercourse, tended "to destroy American prestige and damaged every American enterprise in China." Mr Millard, a

well-known correspondent, gives in his book an account of the company, fully confirming the other American writers above cited, and concludes: "Thus ignominiously terminated the first important project ever launched under American auspices in China." It may be added that, so far from the Chinese being governed by a spirit of hostility to foreigners in this matter, the present native company, under which the railroad is now being built, is ordering passenger cars and other rolling stock from American manufacturers.

The Shanghai riot of a year ago, which was greatly exaggerated in the press reports and led to the assembling in that port of the war vessels of our western powers, including the United States, grew out of the attempt of the foreign authorities in the settlement to exercise control over a Chinese woman charged with a misdemeanor. A full account of this riot was given by Mr George Kennan, of this city, then in China, in the *Outlook*, in which the Chinese authorities were vindicated. Such was the conclusion of the American Consul General. The British Minister for Foreign Affairs, in discussing the riot in the House of Commons, stated that the Chinese judge was right in the case, and that the attempt of the municipal authorities to exercise jurisdiction was "unfortunately an act that was not warranted by our treaty rights. * * * It shows the danger of encroaching on Chinese jurisdiction in these foreign settlements."

So far as the anti-American boycott is concerned, to vindicate the conduct of the Chinese people there is need only to quote the language of the President of the United States in his message to Congress, in which he says that "in the effort to carry out the policy of excluding Chinese laborers, Chinese coolies, grave injustice and wrong have been done by this nation to the people of China." And he clearly states the cause in this language: "The main factor in producing this boycott has been the resentment felt by the students and business people of China, by all the Chinese leaders, against the harshness of our law toward educated Chinamen of the professional and business classes." The boycott was but the ebullition of the hour, in which the patriotic spirit of resentment of the sedate Oriental boiled over for the time; but the usual friendly feeling for America soon reasserted itself, even before the amendments of the law promised by the President were voted by Congress. I venture the assertion that every fair-minded American citizen applauded the Chinese demonstration of resentment, and his only regret was a feeling of humiliation that his country should be guilty of so flagrant a wrong to a proud but unoffending people.

A great outcry has been raised, especially in British journals, because of the creation during the present year of a new commission of two prominent Chinese officials, called the "Customs Board," because it was supposed that it was the intention to supersede Sir Robert Hart, a British subject, who for forty years and more has so successfully managed the maritime customs. The Chinese Government, however, has given positive assurances that it had no such intention. Sir Robert, who continues at the head of the customs, has issued a circular stating that no change was to be made, and another of the evidences of the Chinese hostility to foreigners is shown to have no substantial foundation.

The cry of "China for the Chinese," which is most heard among the students returned from Japan and other foreign countries, has given rise to the fear abroad that the Empire was on the eve of another uprising against foreigners, such as the Boxer outbreak of 1900. Foreign powers having citizens or interests in China were advised to strengthen their navies in those waters, and it was even said that it was the purpose of our government to reinforce the army in the Philippines, so as to have an available force near by for the expected emergency. But such fears thus far have proved illusory. Notwithstanding the anti-dynastic societies, the spirit of unrest

occasioned by the reform measures, the rice famine, and other disturbing causes, the past year has been more free than usual from public disorders—would it be an invidious comparison to say, less dishonored by riots and lynchings than the United States?

There have been some outbreaks of race hatred, but they have been due in large measure to exceptional and local causes. The Lienchou massacre of the Presbyterian missionaries was a lamentable occurrence; but the missionaries exonerated the authorities from any deliberate negligence or sympathy with the rioters, and full indemnity has been made for the losses. It appears that there still remain some vestiges of the Boxer organization. A correspondent, writing in August last from the interior province of Shensi, in which the Court took refuge when the allied army occupied Peking in 1900, gives an account of the sudden appearance in a small town, the scene of the story, of a band of Boxers. They assumed a threatening attitude, especially toward the foreigners in the town, and the latter were compelled to seek refuge in the yamen or office of the town magistrate. The Boxers followed, demanded food from the magistrate, and also authority to kill the foreigners. By this time the whole town became completely terrorized, the merchants closed their shops, and the people were in a state of panic. After receiving food the Boxers withdrew to a large temple in the town, announcing their intention to kill the foreigners and Christians the next day.

Their plan, however, was frustrated by the opportune arrival of a German lieutenant, on his way from Mongolia to Peking. He infused some backbone into the people at the yamen, and on the following morning he induced a small force, which could muster only twelve rifles in all, to follow him to the Boxers' quarters. In the skirmish which ensued, after a brief parley, eleven Boxers were killed, many others wounded, and the remainder taken prisoners. That put an end to the Boxer troubles in that province. This prompts me to say that if at the opportune moment, not a German lieutenant, but a resolute officer of the law had appeared at Springfield, Ohio, or Atlanta, Georgia, and laid his hands on or, if need be, shot down the hoodlum leaders, our country and our civilization would not have been disgraced a short time ago with the barbarities there perpetrated.

REFORM OF FOREIGNERS

It is true that there does exist in China a certain feeling of resentment against foreigners; but, in view of the spoliation of their territory, the enormous indemnities exacted, and the disposition to establish a foreign monopoly for the exploitation of their industries and mines, it must be admitted that this feeling is not without some justification. Colonel (Chinese) Gordon said forty years ago that the Chinese "have suffered much wrong from foreigners who have preyed on their country." The occurrences since that time have intensified this fact. So, also, the conduct of most foreigners, the missionaries excepted, in their intercourse with the natives has been truthfully described as masterful, high-handed, and generally overbearing.

An interesting discussion of this subject has been going on recently in the Shanghai *News*. A native, who signs himself "A long-gowned Chinaman" and is vouched for by the editor as a cultivated and educated gentleman, has stated the Chinese side of the question so forcibly that I cannot do better than quote some of his views. In his discussion with the editor he writes:

"The movement of what you call the Young China party, erratic perhaps now in many ways, has its root in the intense feelings of the Chinese people that they have not been fairly and justly treated by foreigners. The true aspiration at the bottom of this movement which is claiming China for the Chinese is to ask for a readjustment of our relations with foreigners on a fair and just basis. The one true and principal object which the people of China in their hearts want in

this matter of reform is not so much railways, not new learning, not European luxuries, not European civilization—what the people of China in their hearts want is to bring about the reform of the foreigners in their way of dealing with the Chinese. A sagacious Englishman in Hankow once said to me, 'What fools these people in Shanghai are. Why, if the Chinese really succeed in their reforms, do you think we foreigners in China would have such a d—— good time as we are having now?' In a word, the Chinese people want the foreigners in China to reform by knocking out of their heads the idea that God has created the three hundred odd million Chinese for the British and other nations to trade upon, to make a living out of them. The only way to abate the fever and intensity of feeling against foreigners is to begin the reform in China at both ends, on the foreign side as well as on the Chinese side."

IMPROVEMENT OF THE CITIES

I cannot close this review of the present condition of China without a reference to the improvements going on in some of the principal cities. These are very noticeable in Shanghai, in the new, enlarged, and more attractive public buildings and private residences, the extension and improvement of the streets, and the increased facilities of locomotion and suburban travel. Shanghai is, however, under foreign control, and the improvement, while an indication of growing wealth and commerce, is mainly the development of western enterprise. Of the native cities, Hankow has shown much growth and improvement, but the two cities giving greatest evidence of progress and improvement are Peking and Tientsin.

Few things in civilized life are more repulsive than the interior of a native Chinese city, and this was especially the case with Peking until the past few years. Since the occupation of the allied army, and especially in the last two years, a marvelous transformation has taken place in the capital. The former broad thoroughfares, undrained, unpaved, and reeking with filth, have undergone a wonderful change. In the center there has been constructed a wide macadamized road, with a parking on each side planted with trees, and next to the houses a paved sidewalk is laid with curbing and drain. A system of sewers has been adopted, and the city presents the appearance of having been thoroughly swept and garnished. A uniform police force adds to its city-like appearance. A telephone and electric service has been established, and tramways traverse the principal streets.

The transformation of Tientsin has been even more effective and complete. It received its first impulse under the International Government which was established during the foreign allied occupation, and of which Hon. Charles Denby, Jr., was the secretary and active executive officer. The native municipality, one of the largest in the Empire, has been so changed that an old resident absent for a few years would hardly recognize it. The old wall which surrounded the land side has been entirely removed and replaced with a wide boulevard, paved and planted with trees, and which extends also along the water front, with an electric tramway traversing its whole extent, lined with attractive shops. The former houses, all of one story, of unburnt brick or of thatch and reeds plastered, are giving place to others of larger proportions and of substantial construction in European style, many of two stories, and indicating a degree of comfort which could not have been dreamed of a few years ago. The process of widening the interior streets, tearing down walls, and the construction of more sanitary dwellings, besides improving the general aspect of the city, has also greatly improved its health. The lighting and police arrangements are of a similar character, and it enjoys a blessing possessed by few other of the native

(*Continued on page 709*)

THE GREATEST HUNT IN THE WORLD

By Eliza Ruhamah Scidmore

Foreign Secretary National Geographic Society, Author of "Winter India," "China—the Long-lived Empire," "Jinrikisha Days in Japan," "Java, the Garden of the East," etc.

This is the first of a series of six articles by Miss Scidmore which will be published in early numbers of the National Geographic Magazine. *Each article will describe one of the wonders of the East, and each will be profusely illustrated.*

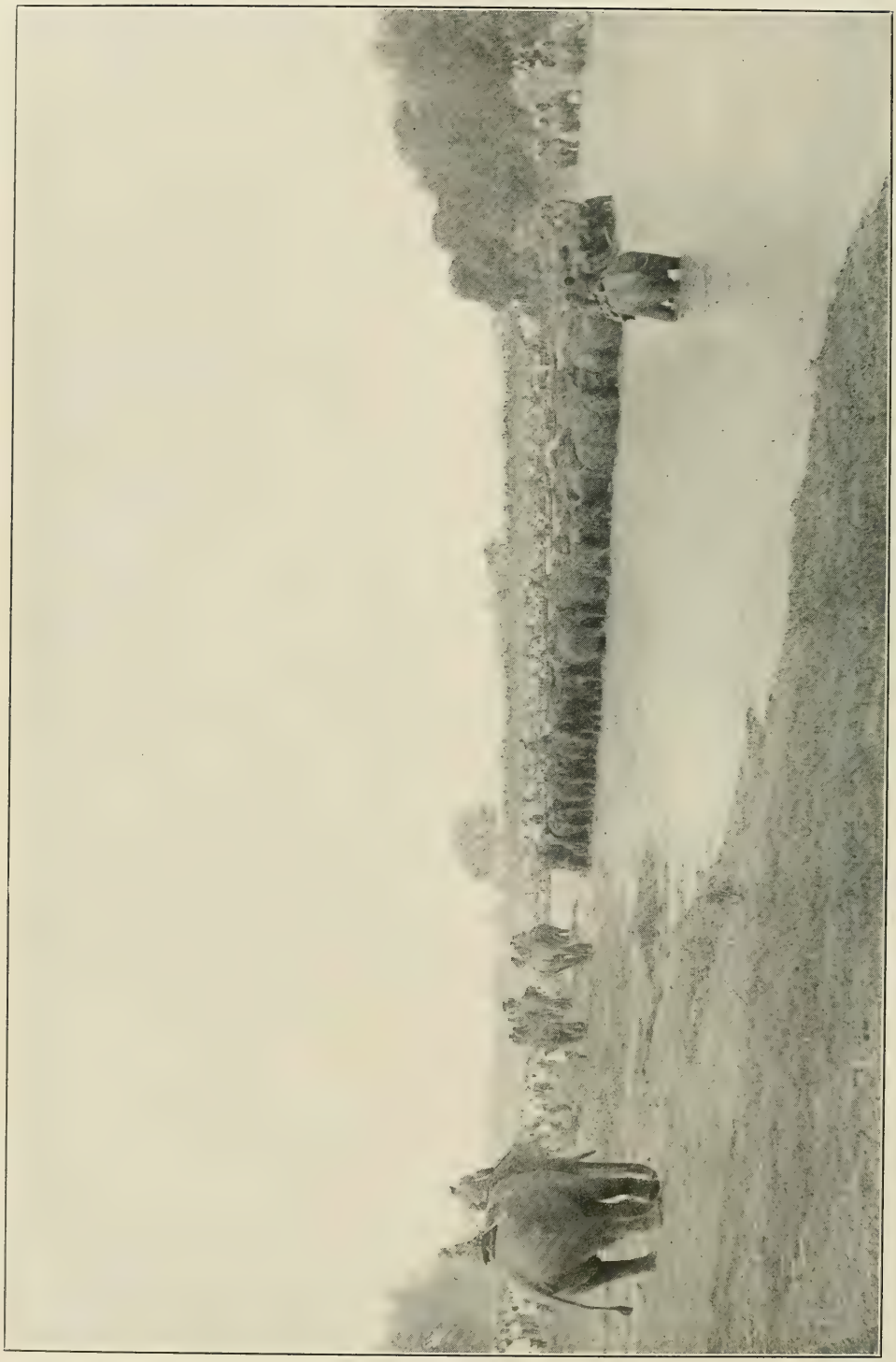
ALL other hunts and drives, battues, and baggings of big game are insignificant compared to the elephant hunt of the King of Siam. It is an old as well as a picturesque custom and, surviving to the Twentieth Century unchanged in all its important features, is still the delight of the court of Siam, the capital, and all the water-side country around old Ayuthia. It used to be an annual affair, but there have been serious lapses in this reign, owing one time to the King's absence in Europe, again to his little discord with France, and yet again to his ill health. There are forebodings lest the great chase be given up of necessity, as time goes on and enterprising Siam keeps up its irrepressible gait of modernity. Progress and the new agriculture, railway extension and irrigation are turning the jungle into limitless rice plains, and the screech of the locomotive drowns the trumpeting of the wild elephants and scatters them in panic to further jungle country.

The royal elephant hunt was a more serious affair, perhaps, when that majestic beast was the only means of royal travel on land, and the elephant corps and elephant batteries were the *corps d'élite* and most important branch of the army. London-built landaus on pneumatic tires and automobiles stand in the palace courts, and long-range, quick-firing machine guns of the Japanese pattern are the equipment of the royal artillery. Save for tradition and sentiment, for occasional state splendors and parades, the elephant has no part in Bangkok court life, and the elephant's occupation would be gone were it not for the survey corps, the road-builders, and official traveling in the far-away provinces, and the teak forests and timber yards, where American overhead machinery cannot altogether supplant the intelligent strength of the elephant.

For the great hunts at Ayuthia, site of the abandoned capital, the hunters go out weeks beforehand and beat the jungles for a hundred miles to north and east, and the cordon of tame elephants slowly closes around the wild elephants and drives them in a herd of two and three hundred and more down to the river bank, and across to the King's kraal.

The last hunt of this kind was arranged for the special enjoyment of the Crown Prince after his return from his studies at Oxford and his tour of America, and before he assumed the robes of a Buddhist priest and spent the regulation three months in a monastery, in accordance with old Siamese custom. It was a most successful hunt, and the series of large photographs, which are reproduced here, present the different stages of the hunt and show the herd of two hundred and fifty wild elephants in every pose.

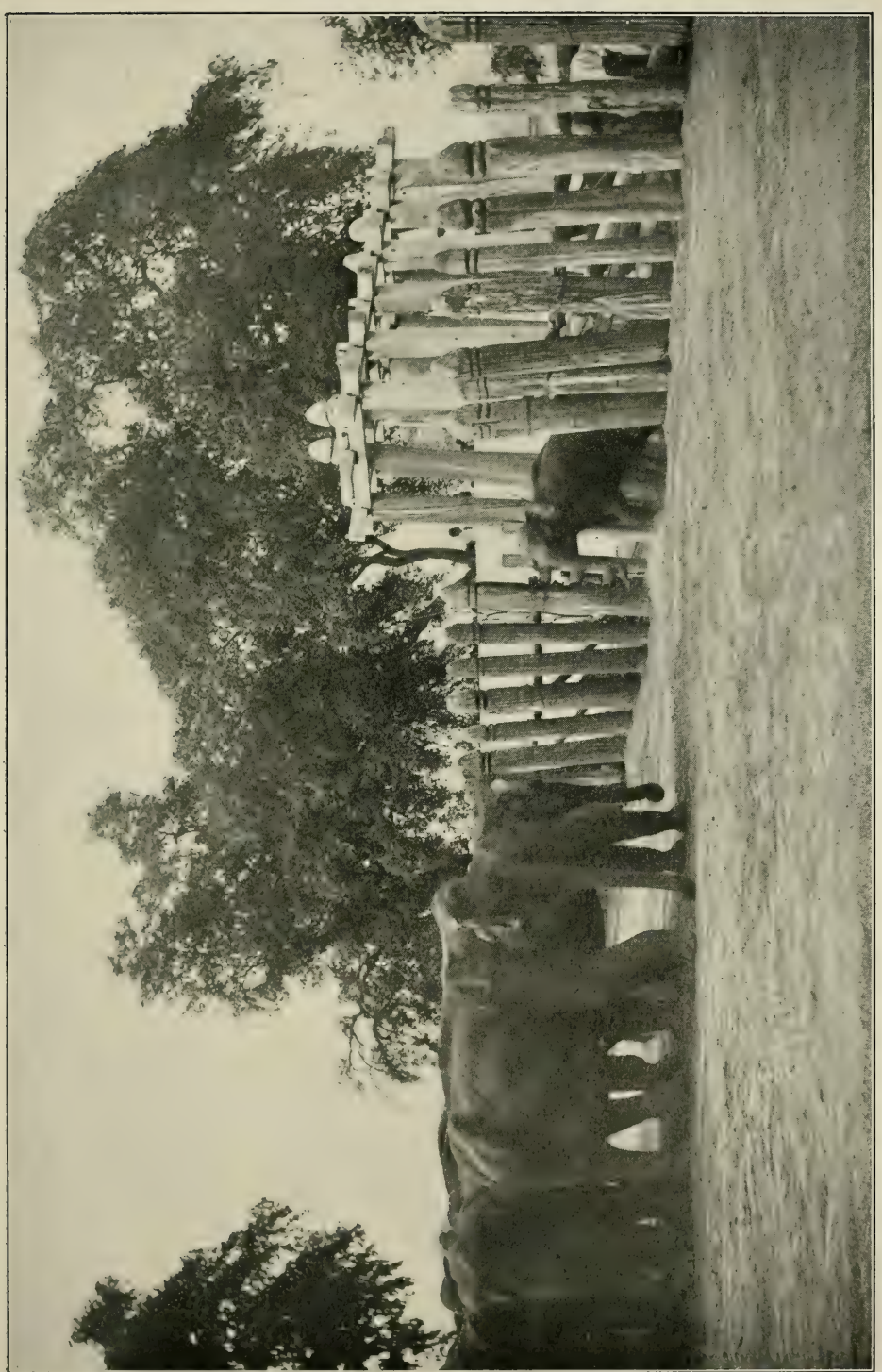
For the hunt week, the court stays in residence at the near-by palace of Bang-pa-in, on the river banks, and the diplomatic and other foreign guests go up to Ayuthia on their house-boats, which luxuriously lodge them during the time. All Bangkok that can find foothold, goes up the forty miles by train, and all the river-



Wild Elephants Led by Tame Ones Crossing the River, advancing nearer and nearer to the Kraal

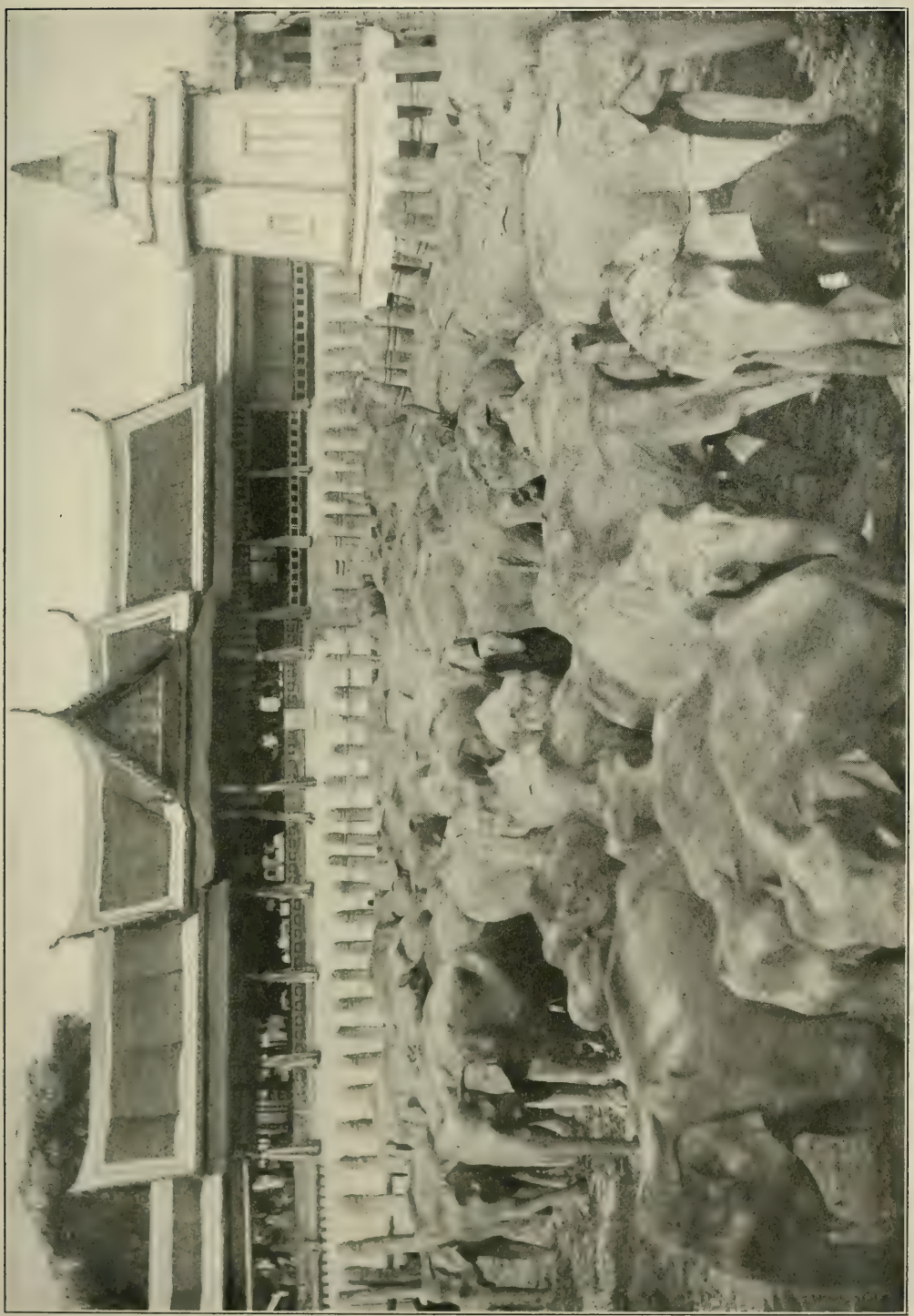
Driving Wild Elephants Across River to Kraal at Ayuthia

Wild Elephants Entering the Kraal

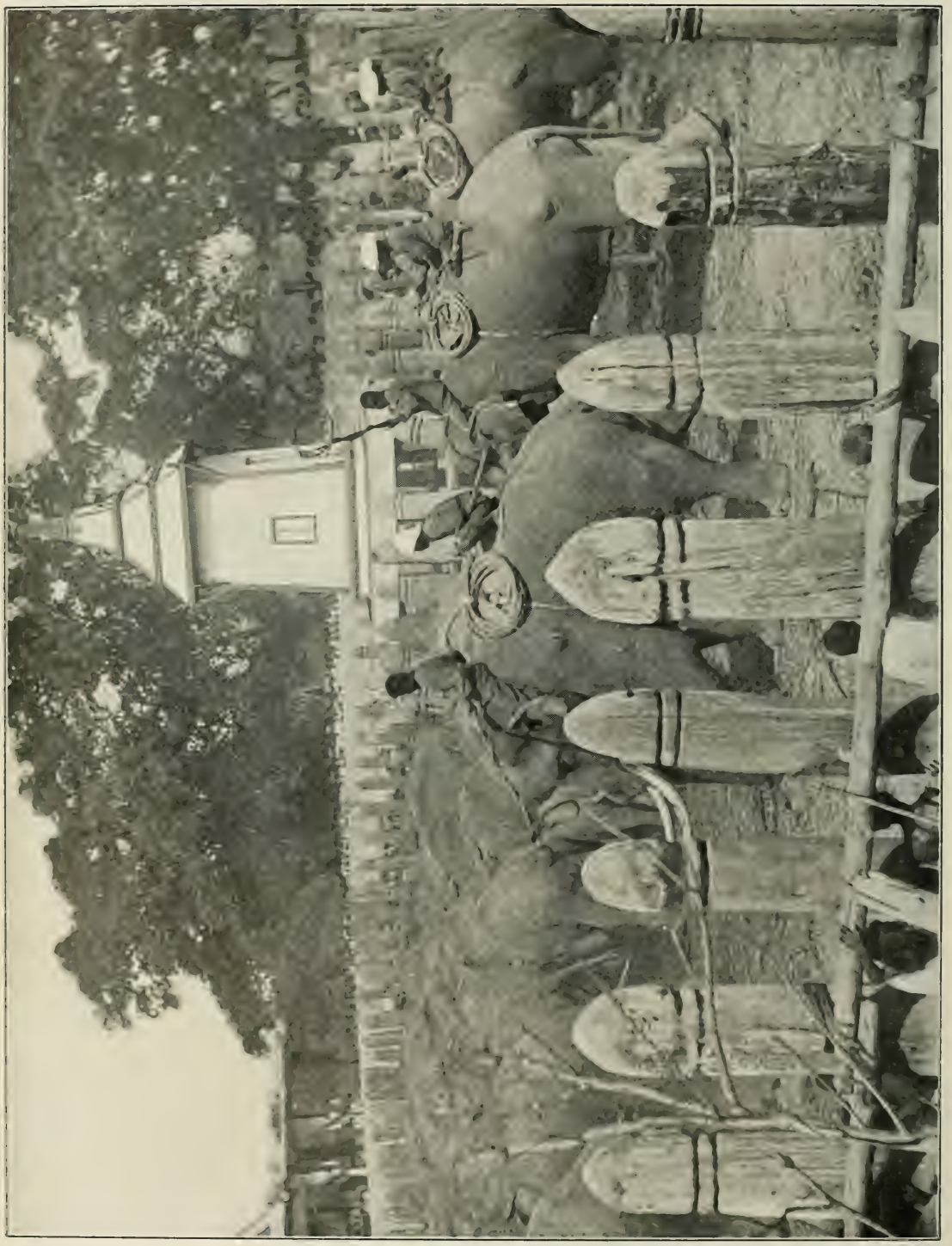


Wild Elephants Trying to Enter the Inner Kraal. Notice the thinness, bones, and patches of fungus on the elephants

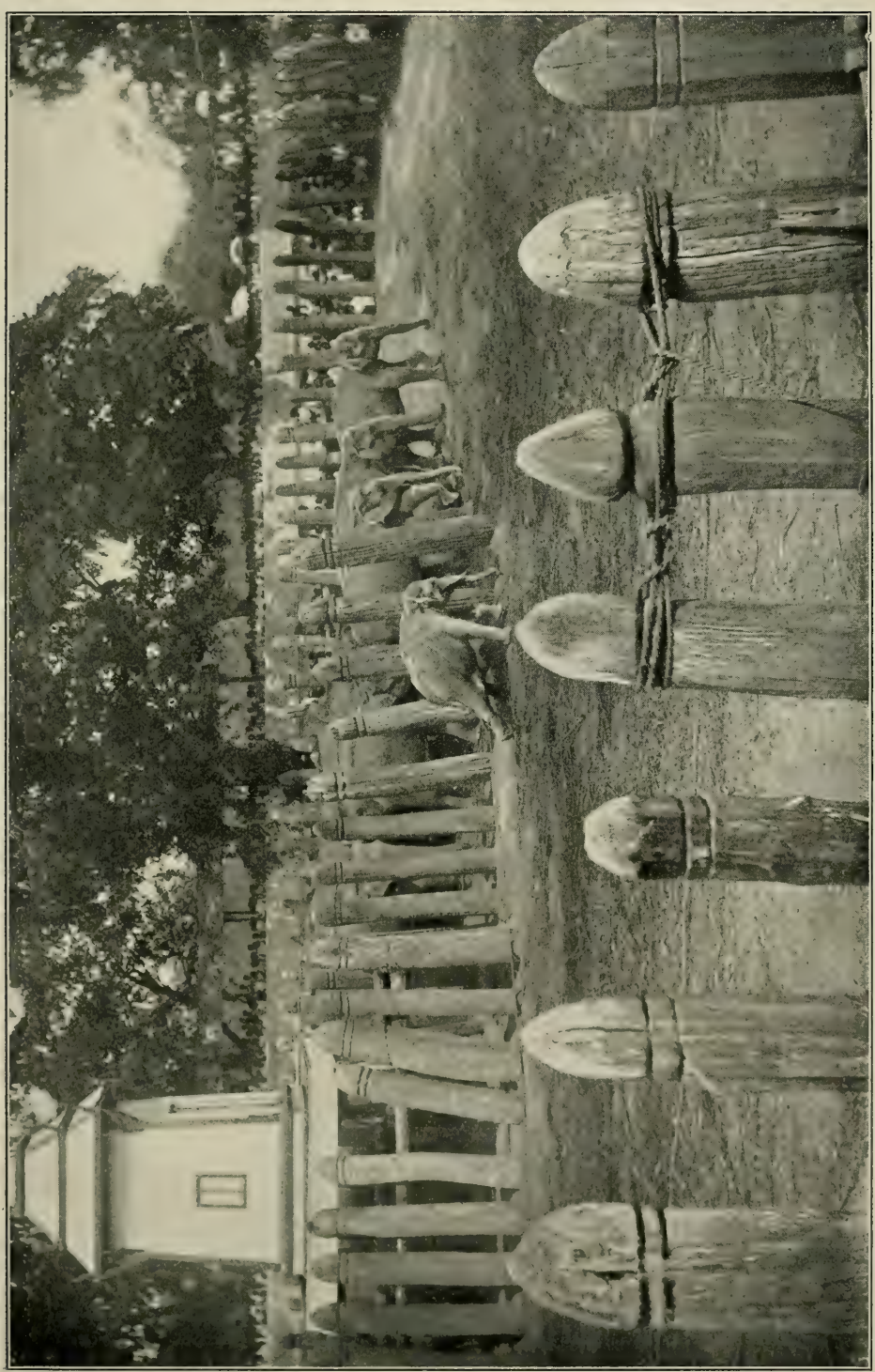
Tame Elephants Assisting to Raise the Injured Elephants, which have been trampled over during the scramble into the Kraal



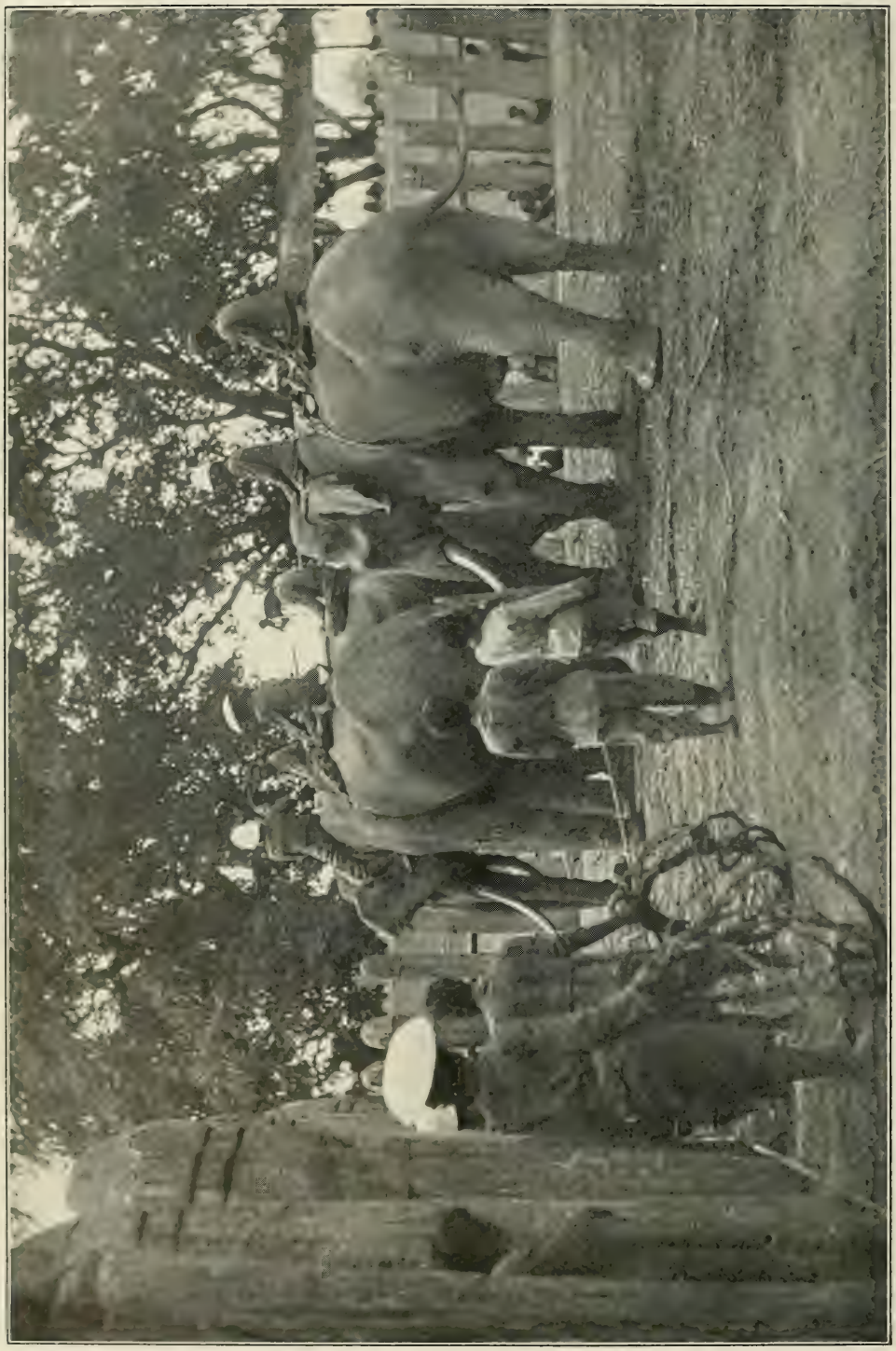
About 250 Wild Elephants at Peace in the Kraal



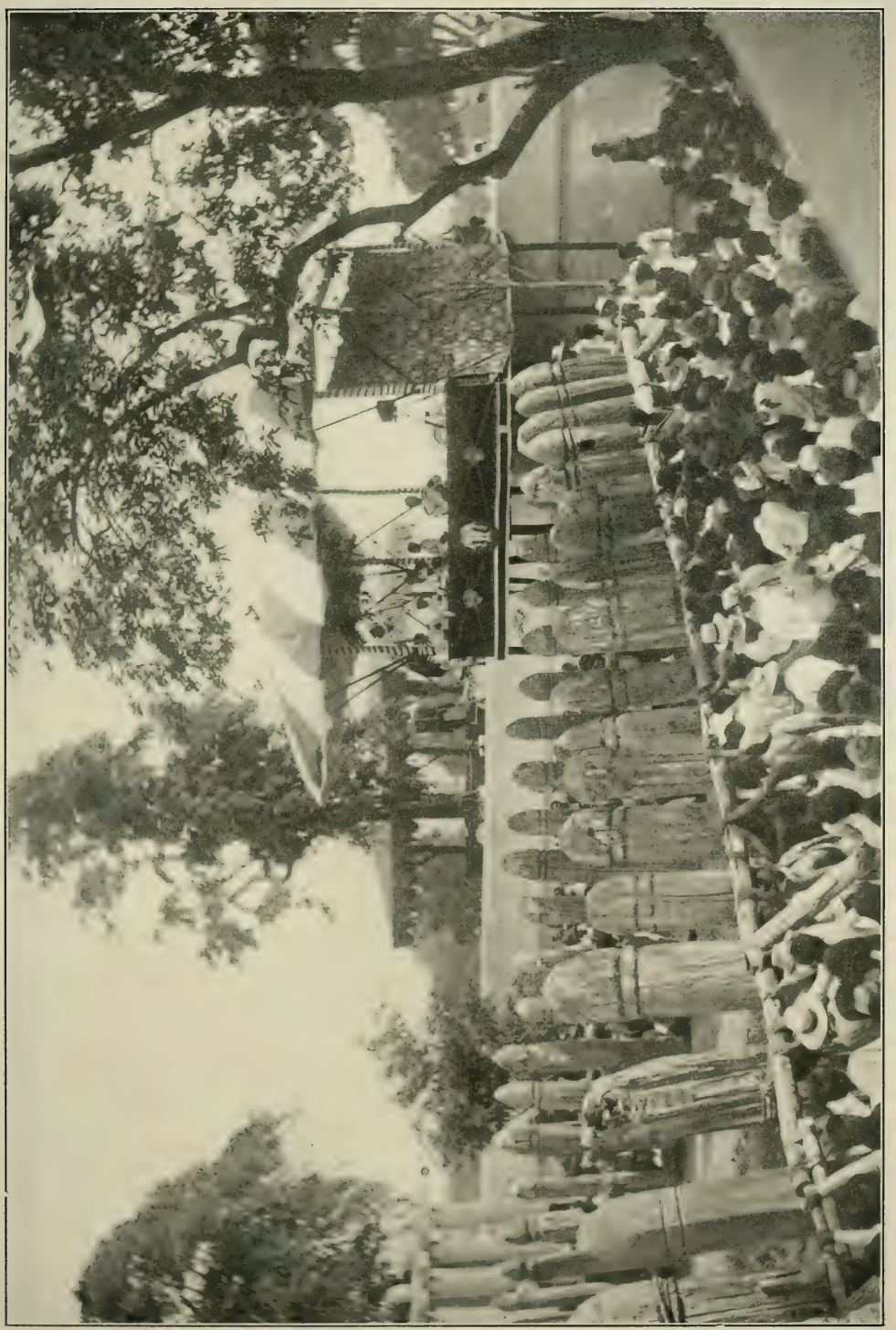
Setting Out to Capture the Elephants



The First Young Tusker Captured and Roped by the Hind Leg



Leading Out a Captured Elephant



His Majesty the King Taking Photos During the Hunt at the Kraal

Preparing to Hunt Outside the Kraal

side and creek-country people paddle their small boats and dug-out canoes to the arm of the Meinam, on which the King's kraal lies, until dead and buried Ayuthia by the waters comes to itself again, and its canals and creeks and water boulevards are as crowded as in the centuries when it was a great capital of Asia.

When the hunters have urged the slow-moving game out from the jungle to the river bank, the sight is worth all Siam's efforts to see. Hundreds of boats hem the herd, at a safe distance, and while the hundreds of elephants splash and roll in the stream, the buzz and shouts of the thousands of people set the elephants' nerves on edge, cause them to trumpet and spout water over their gaunt companions more fiercely than playfully. There is contrast enough between the wild and the tame elephants, standing plump, benign, and imperturbable on guard behind them, waving their trunks easily, flapping an ear now and then. It is for these sleek guardians to lead and steer their jungle cousins across the meadow and into the converging approaches to the kraal. This square enclosure has solid walls six feet thick, with an inner stockade of teak logs twelve feet high, banded together with iron, and set so closely together that there is barely space between for the slimmest Siamese to squeeze through if pursued.

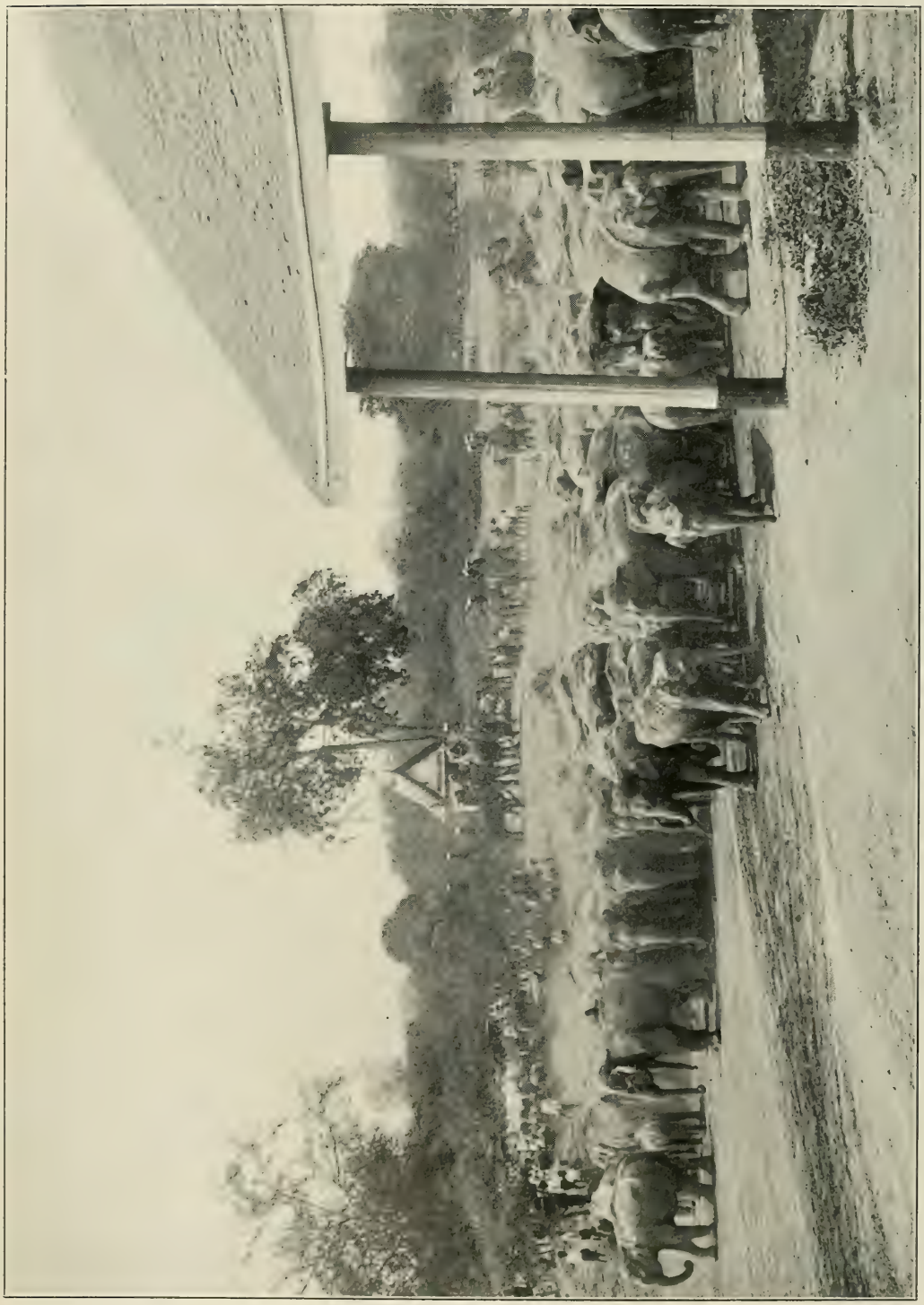
The grand stand, with its royal loge, from which the King and his guests view the scene, is built over the north wall of the kraal; but, as this position of honor and fixed Asiatic convention is a bad one for photographers, the King, who is an enthusiast over the çamera, has had a special pavilion constructed at one side, where he maneuvers his instruments, large and small, with the greatest spirit. Nearly every one carries a camera to the elephant hunt, but none snap at royalty, except by request, in so highly civilized a country as Siam. At this last hunt, the King photographed many of the diplomatic house-boats as he sped down the watery reaches, and was delighted when he caught one favorite envoy unawares. "Now you snap me!" cried the King, in amend, and had his boatmen swing his brass-trimmed, teak house-boat around and stop it at the right angle and distance.

As the wild elephants crowd up and into the narrow chute leading to the kraal, trumpeting and shuffling nervously in their fright, the scramble and crush is terrific. After the huge logs have closed the wicket or portcullis, the tame elephants go round as an ambulance corps, assisting bruised and injured elephants to move and rise to their feet and turning the dead ones over out of the way. At every hunt several beasts have their ribs broken and the life crushed out of them in this crush at the gates; for when two frantic elephants try to go through at once, neither one yields or draws back, and the strongest and largest one survives.

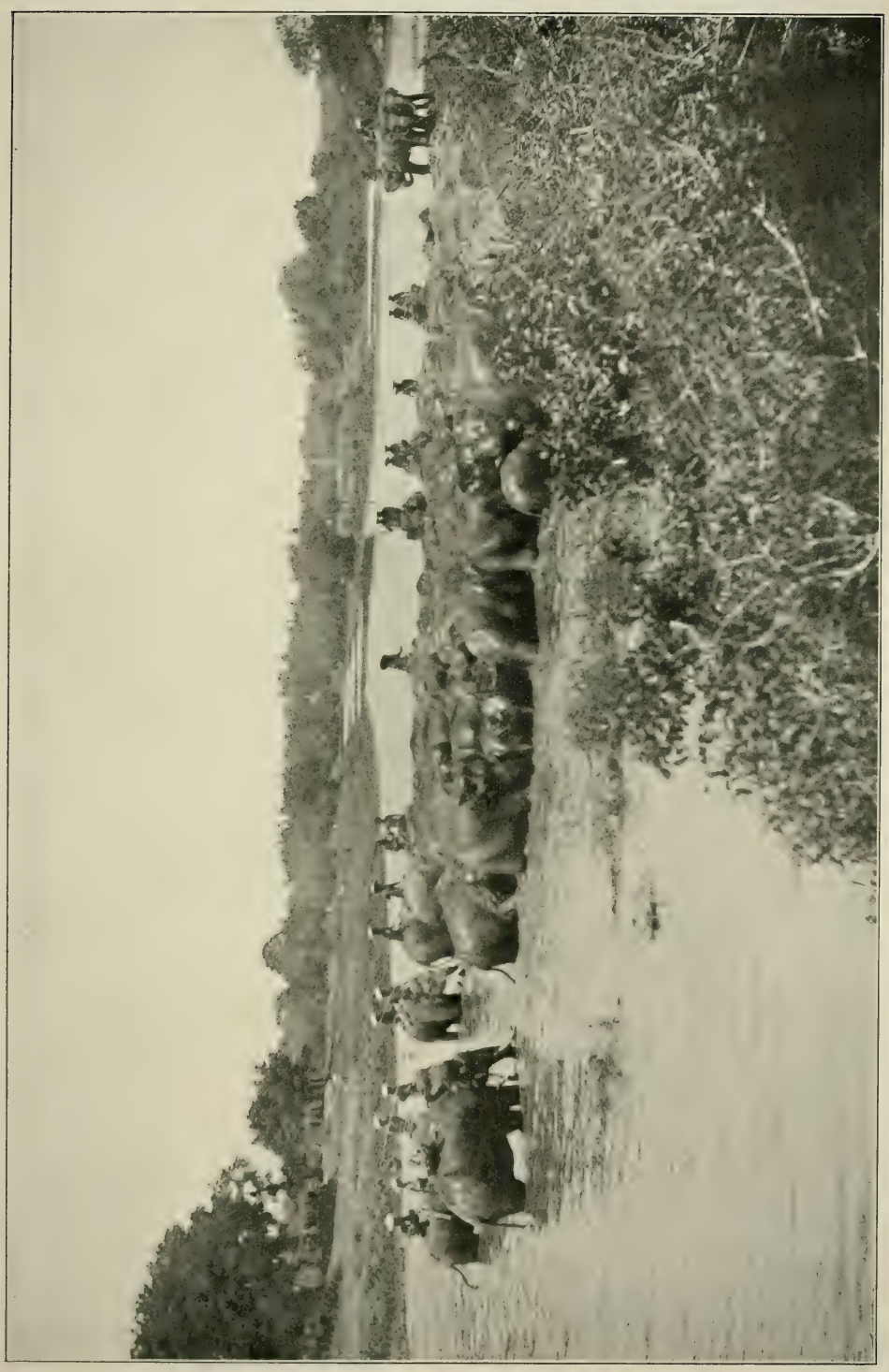
After this actual theater panic mildly subsides and the kraal is filled with the wild jungle folk, who trumpet and scream unceasingly, the "elephant doctors" move about on their trained tuskers and note the desirable catches. The chosen ones are lassoed by the foot and made fast to stakes, and their trumpeting and frantic efforts to break loose furnish all the excitement the spectators desire. A few are chosen for the royal stables, but the rest go the practical, commercial way—to the survey camps and the teak forests.

There is great contrast between the sleek, fat, well-fed and well-groomed tame elephants, with their quiet dignity, their benign and easy maneuvers, and the sorry-looking jungle folk—gaunt, weather-worn elephants, with visible ribs and patches of fungus growth—but a few weeks of care and food, a few scrubbings and oilings, transform them, and they soon acquire the urban manner and composure.

Every Siamese is a connoisseur and critic of elephants, and judges unerringly from the wild herd. First, the creature should have a good skin, unscarred, of uniform wrinklings or texture, and as light in color as possible. His toes should have black nails and his tail must

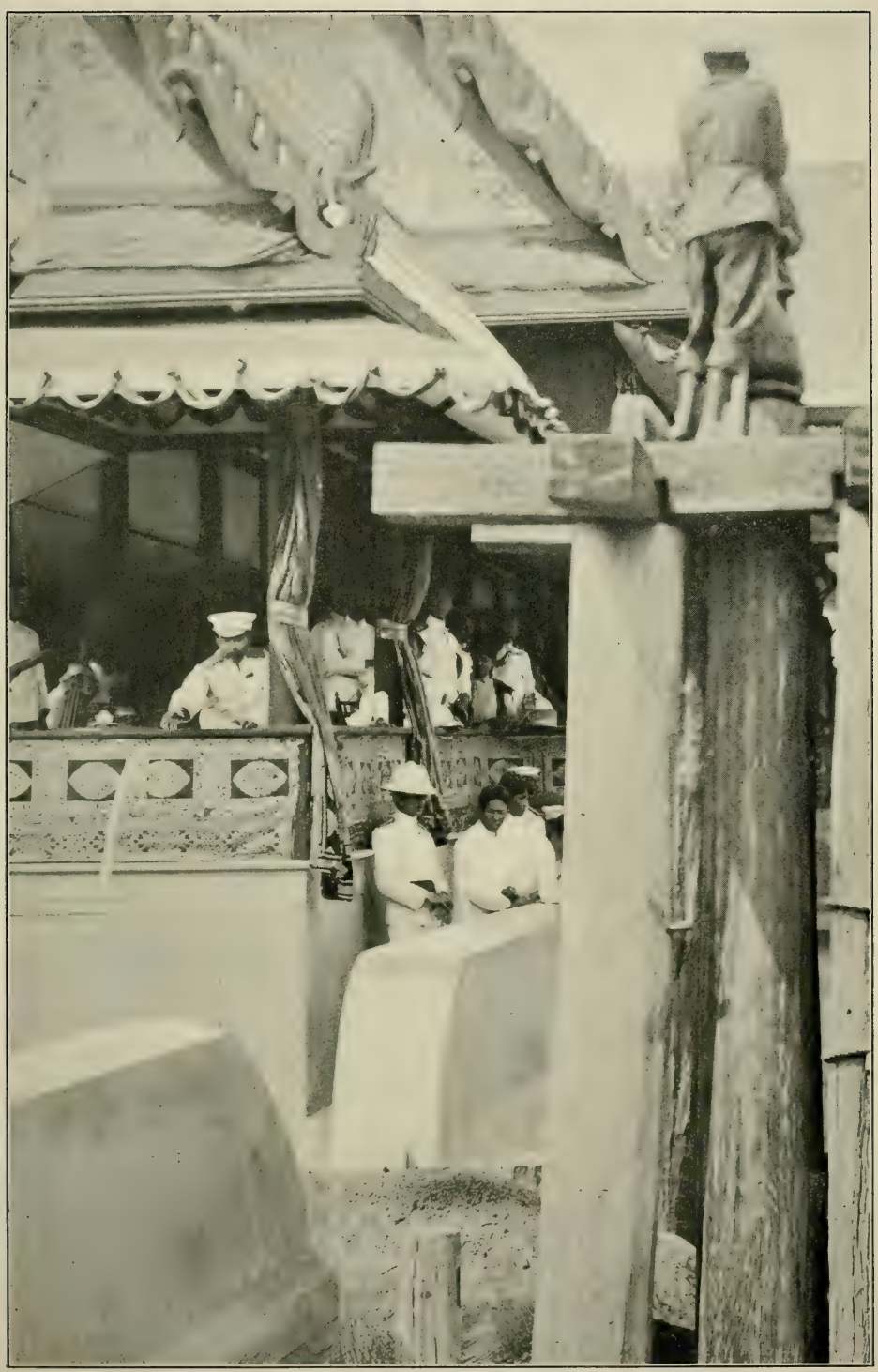


Ayuthia—Elephant Herd

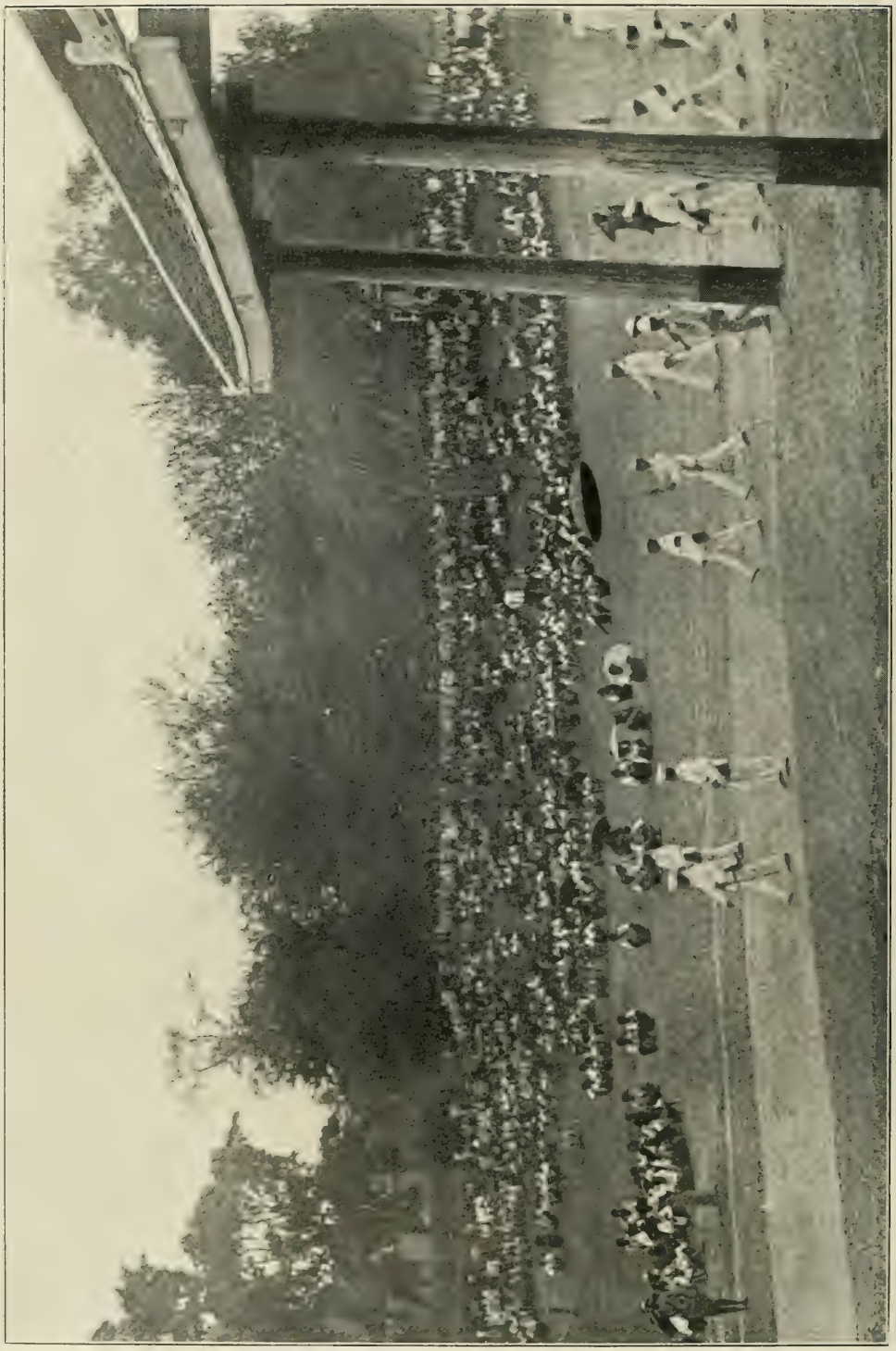


Wild Elephants Taking a Bath in the Stream, surrounded by a cordon of tame elephants

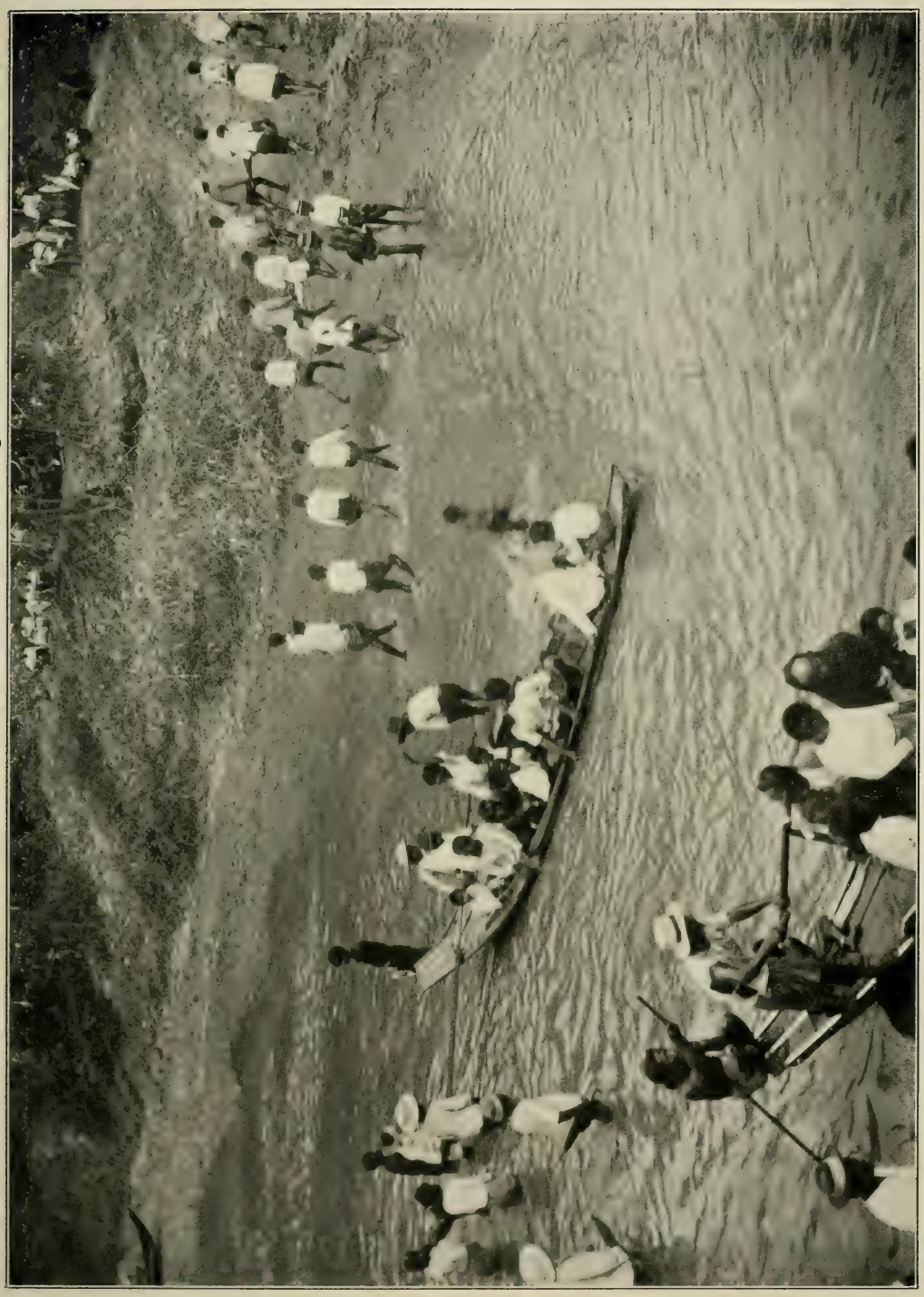
Wild Elephant Broken Away and Fighting Tame Elephant



The King at Corner of Royal Box Choosing an Elephant



The King and Suite Leaving the Kraal After the Hunt



Natives Fording Canal on their Way Home After the Hunt

be absolutely intact. Insignificant as the elephant's tail is, the want of it renders the creature impossible and ridiculous; and many a promising elephant is rejected at the kraal because he has lost his tail in some jungle fight. A steady, even gait is necessary for the elephant to be used in traveling.

When the wild elephants have been chosen and made fast to stakes, they sometimes break loose and wreak their frenzy on the first animal in sight, and battles royal between fierce tuskers often enliven the after-hunt. Then the air rings with the shouts of the people and the Siamese thinks he has had a royal holiday indeed.

When the final choice has been made and the rejected elephants are turned back into the meadow, fed and freed, the King rises and goes to his boat. The King of Siam is one of the most kingly-looking men now gracing a throne—"the handsomest man in Asia," many of the diplomats call him—and in his white military uniform he steps off at a pace that puts the royal umbrella-bearer at a dog-trot to keep up with the strenuous ruler. At sight of the King in his European clothes, under his Asiatic umbrella, the people sink on their heels and remain in pose of reverent humility until he has passed. Then the people, who have enjoyed the holiday to the full, take a fresh betel quid, tuck up their *panungs,* paddle away or wade the stream, and Ayuthia becomes again but a busy water village near some ruined temples in the jungle.

LATIN AMERICA AND COLOMBIA*

By Hon. John Barrett

United States Minister to Colombia

WHILE appreciating greatly the honor of an invitation to open the lecture course of the National Geographic Society and thanking you for giving me that honor, it is necessary to express a word of explanation and excuse. Although I have studied South America in general and Colombia in particular with great care for many years, I honestly feel that there must be many people in this audience who are more familiar with the subject and who could give you a better discussion. For example, I see present here tonight the new Minister of Colombia, Senor Don Enrique Cortes, one of the most distinguished men of that country, who could entertain you with a more accurate description of his wonderful republic than it is possible for me to do.

Inasmuch as your course includes other addresses on South America, such as those of my colleague, Mr Lee, Minister to Ecuador, on that country; Dr Calderon, Minister of Bolivia, about his republic, and Mr Johnson, concerning the Panama Canal, it has seemed fitting that, in the first part of my talk tonight, I should take up some general references to all Latin America, and more particularly because South America has come so prominently before us on account of the remarkable visit of Secretary Root to the capitals of that part of the world.

THE VISIT OF SECRETARY ROOT

Too much emphasis cannot be laid upon the character and significance of Mr Root's tour of South America. It has not been fully appreciated in the United States. The natural modesty of the Secretary of State has kept him from describing the cordiality of the treatment he received at the hands of the South

* An address before the National Geographic Society, November 9, 1906.

Mr John Barrett Archbishop of Cartagena Mr Root General Alfredo Vasquez-Cobo, Minister of Foreign Affairs Governor Passos of Cartagena

Secretary of State Root and the Committee of Reception at Cartagena, Colombia, September 24, 1906

Americans. The press of the United States, while following Mr Root's trip, failed to catch the spirit and greatness of the reception, as was plainly shown by the South American press. We of North America should be profoundly grateful to all South America for the way it received Mr Root. It was a splendid compliment to us, which we have failed to reciprocate in any expression of approbation. Many of you remember the honors showered upon Admiral Dewey when he arrived in this country after his Philippine achievements. It is no exaggeration to state that Mr Root was greeted with a Dewey reception in every capital of South America which he visited. There was no lack of real enthusiasm in the cheers and plaudits of the throngs that bade him welcome. Those of us who have lived in South America know the difference between a reception that is heart-felt and one that is perfunctory. In no place was the reception of our Secretary of State perfunctory.

In each capital and city where he was the guest he was given every attention possible. Had he been the President of the United States or a European monarch, more could not have been done for him. The South Americans were grateful, and wished to show their gratitude, because we sent to them one of our greatest men. They appreciated the fact that he is the premier of our cabinet; that he is regarded as one of our ablest lawyers as well as being a high-class and distinguished politician, and that he represents the intellectual as well as the material side of our progress. In short, they looked upon him as the best we could send, as an ambassador of good will, next to the President himself. Heretofore every South American country had been visited by princes and distinguished statesmen of different European countries, but the United States, in the passing of years, had seemed to neglect South America, as if it were not worthy of the recognition which Europe had given it. When, therefore, the United States, through the sagacity of President Roosevelt, arose to the occasion and sent one of its foremost statesmen, South America returned the compliment with a reception unsurpassed in the history of the Western Hemisphere. Now it behooves the United States to take advantage of what Mr Root has done by fostering in every way a movement throughout our country for greater intercourse and acquaintance with Latin America, from Mexico to Argentina.

A LATIN-AMERICAN MOVEMENT NEEDED

The time is at hand that calls for what might be termed a widespread Latin-American movement in the United States. The commercial and economic possibilities and social conditions and progress of our southern neighbors invite our immediate and particular attention. To say that it may be "now or never" with North American prestige and trade in Central and South America is not a statement of an alarmist or pessimist. It is a simple and logical conclusion drawn from a thorough study of the actual situation.

There never was a period in the history of the relations of the United States with her sister American republics that afforded such combined opportunity and necessity as the present for the development not only of our moral influence, but of our commercial interests. On the other hand, there never was a time when European nations and business interests put forth such efforts as they are now legitimately exerting to increase their own prestige and trade in South America. Although the situation should be one of closest rivalry, where the United States can and ought to win, if it does not give Europe too long a start, the advantage now is decidedly with the latter. There is no gainsaying the fact that Latin America today is strongly inclined to be more sympathetic, in its actual likes and dislikes, with the old world than with the United States, because of plain reasons of race, language, and association.

Hand Propelled Freight Boat for Shallow Tributaries of Magdalena—Large river steamer in background

LATIN AMERICA MAKING RAPID PROGRESS

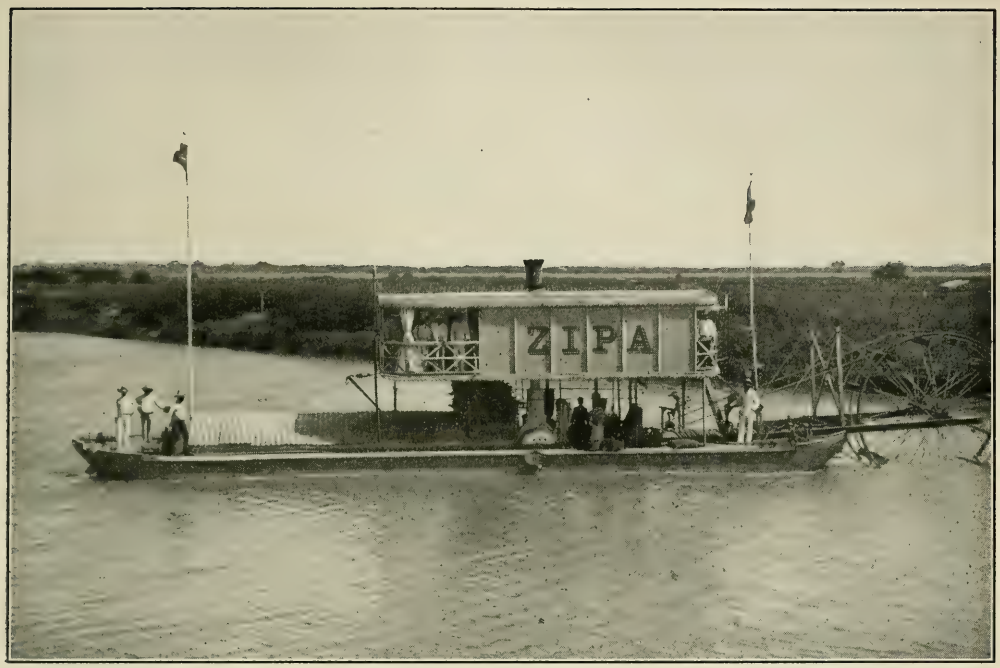
Many of our sister republics are now making a progress that challenges the attention and respect of the world. Some of them are going forward with such splendid energy that they are running a close race with the past records of the United States and the present achievements of Japan. Others are on the verge of a progressive growth that will astonish skeptical critics of the Latin race and delight knowing admirers of their latent possibilties.

In short, it is safe to predict a forward movement during the next decade for the Latin American republics that will give them a position and prominence among the nations of the earth not thought possible a few years ago. It will bring to them a commerce for which the United States and Europe will compete with every resource at their command.

APPRECIATION OF LATIN AMERICA

The speaker admits that he seems to talk with an element of prejudice. Frankly, he likes Latin America and the Latin peoples! The more he sees of them the better he respects them. Would that more North Americans could become better acquainted with South Americans, study more intimately their impulses, ambitions, hopes, achievements, and see things from the Latin-American standpoint. Otherwise expressed, it would be a signal blessing to international Pan-American accord, and it would inaugurate immediately a new era in the relations of the United States with her sister American republics, if, in thinking, writing, and speaking of them, their peoples, and their politics, we could follow the old Biblical adage and remove the beam from our own eye before looking for the moat in that of the Latin American.

Grand Procession in Bogota on Occasion of the Feast of Corpus Christi, with everybody kneeling at special signal of bell in cathedral



Small River Steamer for Tributaries and Canals of Magdalena River

A CRITICAL TIME FOR THE UNITED STATES

The United States has reached a most critical period in its relations with Latin America. What is done or accomplished during the next two years may determine forever the relative position of North American trade and prestige in Central and South America. The recent Pan-American conference in Rio Janeiro and the unprecedented visit of Secretary Root to South America should awaken sufficient interest throughout the United States in this part of the world to inspire our people in general, and our newspapers, our manufacturers, our merchants, our congressmen, our travelers, and our students of foreign intercourse in particular, to a new and active appreciation of the Latin-American republics.

Without half the reason we have for improving the opportunity, European commercial, financial, and diplomatic interests, with commendable judgment and spirit, which we cannot criticise but must admire, are alive to the situation and doing everything legitimately in their power to retain a hold of which they cannot be dispossessed. They keenly realize the present and future possibilities of the material and economic exploitation of Latin America, and they are leaving no stone unturned to gain the necessary advantages before the manufacturers and tradesmen of the United States suddenly become aroused to the situation and compete for its control.

FACTORS UNFAVORABLE TO NORTH AMERICA

A great factor unfavorable to North American trade and influence in Latin America is the *essential difference in lineage and language;* but this point is little appreciated. The power of similarity in race and tongue is mighty. Kinship in these respects brings men closer together. It makes them more sympathetic, and this counts much in Latin countries. The average North American, instead of care-

Bogota is Situated at the Foot of the Mountains on a High Plateau

fully studying methods of counterbalancing these adverse conditions to his progress in Latin America and of adapting himself thereto, undertakes an independent line of action, and ultimately fails in his purpose.

A second great factor is corollary to the first, and it is one of which, in our seeming abundance of knowledge and self-confidence, we are lamentably ignorant. Frankly termed, it should be called the *"holier than thou"* attitude too commonly and persistently assumed by North American statesmen, newspapers, writers, travelers, and business agents when discussing or dealing with Latin America. In other words, the people of the United States have too often and too persistently and characteristically *"patronized"* the peoples, customs, institutions, achievements, and governments of their sister American nations. *Per contra,* we should give Latin America more credit for its actual and praiseworthy progress in developing stable national and municipal government, in promoting both high class and general education, in making its own excellent literature, historical and romantic, in advancing scientific investigation and invention, in solving grave social and economic problems, and comprehensively striving under difficult conditions to reach a higher standard of civilization.

OUR IGNORANCE OF LATIN AMERICA

How few North Americans realize that Latin-American history during the last four centuries is replete with incident and event, names and results, that compare creditably with those of the United States, Europe, and Asia! How few know the names of the great heroes, statesmen, writers, and scholars who have figured prominently in evolving the Latin America of today! How few are aware that the principal countries and capitals of Latin America have groups of eminent

scholars, scientists, and philosophers, as well as universities and professional schools, which are no less advanced than similar groups and institutions in the United States and Europe!

How few North Americans, moreover, of high position in public life, in literary, scholastic, and scientific circles, visit Latin America and exchange courtesies with their fellow-statesmen and students, as they do with those of Europe! No greater blessing to Pan-American accord could now be bestowed than an exchange of actual visits and views of the leaders of Pan-American thought and action. Latin America is too much accustomed to seeing and meeting only those North Americans who are intent on making money, securing this and that concession, and thinking only of selfish material considerations and a return, with pockets filled, as soon as possible to the United States.

A change, a renaissance in higher-class association, acquaintance, and friendship, will not only start an era of good will and better mutual appreciation, but indirectly prove of extraordinary advantage to commerce and trade. European countries long ago realized the distinct advantage of such intercourse with and knowledge of Latin America, and have improved every opportunity to promote more intimate acquaintance.

NORTH AMERICANS MUST LEARN SPANISH

As to language, it is difficult to speak with patience. So small is the percentage of North Americans visiting Latin America, on business or pleasure, who speak Spanish, Portuguese, or French, that it is a wonder they make any progress in their plans. Ninety-five per cent of the Europeans who go to Central and South America understand one of these tongues. French is mentioned because nearly all the well-educated Latin Americans speak that language. This subject requires no argument; it is simply impossible for the North American who knows none of these languages to become thoroughly *"simpatico"* and to master the Latin point of view in either commercial or political relations. I would that both our business schools and regular colleges might make the study of either Spanish, French, or Portuguese compulsory in order to receive a diploma. Portuguese is more important than is generally regarded, because it is the working language of Brazil—and Brazil today is taking rank as one of the great nations of the world; but the average well-to-do Brazilian also speaks French.

LACK OF FAST STEAMSHIP FACILITIES

In studying the causes that act as deterrents to Pan-American accord, we must emphasize the lack of first-class passenger and mail steamship service, such as characterizes the systems of communication between Europe and Latin America. The long-established and well-defined association of Latin Americans with Europe has been immeasurably encouraged by the excellence of steamship facilities, which have given them ready access to the satisfactory conditions found there, in turn for business transactions, education of families, and enjoyment of leisure and travel. If the average merchant and traveler of South America could reach New York with the same comfort and speed that he can proceed to Paris, there would be at once a vast and radical change in the situation favorable to the United States.

This statement is not made as an argument for a "subsidized" merchant marine. The speaker is not discussing the *pros* and *cons* of that mooted issue. He is simply stating a fact and describing a situation. That there is *not one first-class fast* mail and passenger steamer running between New York, in the United States, and such important South American points as Rio Janeiro and Buenos Aires was given glaring prominence by the experience of the delegates to the recent Pan-American conference in Rio Janeiro. Only a few could obtain accommodations on the one little vessel

Señor Don E. Cortes, Minister of Colombia

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General Reyes, President of Colombia

that, with its sister boat, makes monthly trips to the great capital of Brazil. All the others were forced to go via Europe, where six different lines provide a score of splendid, modern, up-to-date, fast ships between the principal ports and those of South America.

No Latin-American merchant or capitalist is going to North America on a slow semi-cargo boat, with limited accommodations, when there are numerous fast steamers bound for Europe with as fine arrangements as the transatlantic liners. This is axiomatic; but it means the loss of millions of dollars of trade to the United States every year, according to the direct testimony of South Americans themselves! It is true that there are excellent freight steamship facilities between North and South American ports, but they do not meet the passenger requirements any more than would a purely railway freight service suit the traffic between New York and Chicago.

REVOLUTIONARY MOVEMENTS EXAGGERATED

Too much importance is now attached in the United States to the idea that revolutions prevail all over Latin America, and that therefore commerce and investments are insecure. This conception of Latin America as a whole is entirely erroneous, and does our progressive sister republics a great injustice. The continent of South America today is free of serious insurrectionary movements, with few, if any, indications of more civil wars. The tendency of public opinion and the powerful influence of large business interests in such great nations as Mexico, Brazil, Argentina, Chile, and Peru are all against revolutionary movements, and, although now and then some slight sporadic attempt shows itself, it is most difficult for it to grow into dangerous proportions. Then, again, the gridironing of these countries with railways permits the immediate sending of troops to any place and crushing without delay incipient revolts.

COLOMBIA: A LAND OF GREAT POSSIBILITIES*

Turning now to the direct consideration of Colombia as a land of great possibilities, I wish first to invite your attention to its remarkable location. Colombia is the only South American country that borders on both the Atlantic and Pacific. It therefore holds a position of strategic value in the development of its commerce and in its relationship to the Panama Canal possessed by no other Latin-American nation. It is the nearest South American country to the Gulf and Atlantic ports and to the Pacific ports of the United States. It is the only South American country that has direct access by water to both the Atlantic and Pacific shores of Central America and Mexico. It is the one South American republic that will benefit more than all others by the construction of the trans-isthmian canal. It has in all a coast line of 1,200 to 1,500 miles—about 700 miles on each coast, including the windings of its principal bays and sea inlets. Along both the Atlantic and Pacific shores are one or two excellent harbors, with lesser ones that can be improved by dredging or the building of jetties. In short, it is splendidly equipped by location to develop a large foreign trade. To give a practical idea of the location of Colombia to the United States, it is well to bear in mind the following facts:

(1) The least distance between Colombia and the United States is only 950 miles.

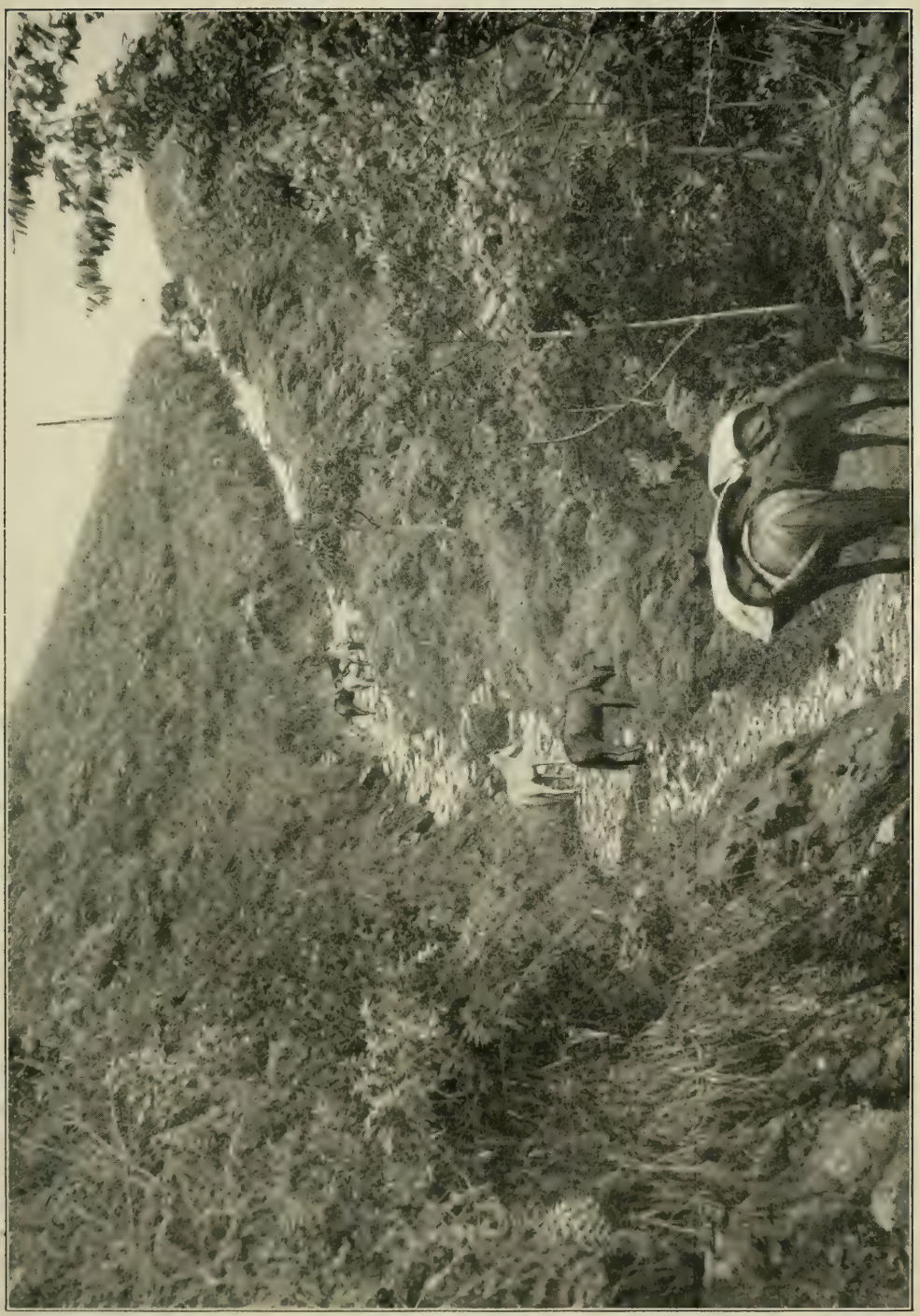
(2) From Cartagena to Tampa, Florida, is less distance by sea than from New York to St Louis by land.

(3) From Cartagena to New Orleans is only 1,400 miles, or four days' easy steaming.

(4) From Barranquilla, another Colombian port, to New York is almost a straight line, due north, less than 1,900 miles and five days' easy steaming.

* For a map of Colombia see the map of South America in the August, 1906, number of the NATIONAL GEOGRAPHIC MAGAZINE.

A Scene in Colombia on the Upper Waters of the River Magdalena



On the Mule Road to Bogota, Across the Mountains from Honda

Street Scene in Bogota

(5) Colombia is nearer than Panama to the majority of Atlantic and Gulf ports of the United States.

THE AREA OF COLOMBIA

The average North American does not appreciate the size of Colombia. Inasmuch as there are eighteen Latin republics, there is a tendency to think that all of them must be small. Nothing better proves the material possibilities of Colombia than to consider its great area. The best estimates, based on the most recent surveys, give Colombia an area of nearly 500,000 square miles. The following comparisons may enable you to form a clearer idea of her extent:

(1) Colombia is larger than Germany, France, and Belgium combined;

(2) Larger than all the coast States of the United States from Maine to Florida united;

(3) Larger than Illinois, Indiana, Michigan, Wisconsin, Minnesota, Iowa, Missouri, Kentucky, and Tennessee merged in one State;

(4) As large as California, Oregon, Washington, Idaho, and Nevada, together.

THE CONFORMATION AND CLIMATE OF COLOMBIA

The land conformation of Colombia provides it with a variety of climate that adds immeasurably to its potentialities. Notwithstanding the fact that Colombia is all in the tropical zone and has a considerable portion very near the Equator,

there are large sections that have a temperate climate in the real sense of the word, where are raised all the products of the temperate zone and where men live and work under as healthful conditions as they do in the northern part of the United States. The Andean mountains, or Cordillera, on entering Colombia from Ecuador divide into three ranges, respectively the Eastern, Central, and Western Cordillera. On these are numerous high plateaus, where the principal cities of the interior are located and whose population is prosperous and progressive. There are numerous level and rolling highlands in Colombia where the thermometer seldom goes above 75 degrees Fahrenheit or below 55 degrees. At elevations of between 5,000 and 10,000 feet, this temperature and agreeable climate is found, and the area of this section would cover that of the New England States with New York and Pennsylvania combined.

The traveler who visits either the Atlantic or Pacific coasts of Colombia with their sea-level altitude and their tropical heat gains an entirely wrong impression of what he would find if he journeyed into the interior. Colombia will never be fully appreciated or understood until it is gridironed with railroads, so that visitors can go immediately from the seacoast to the higher sections in the shortest possible time.

Speaking of the conformation of Colombia reminds me to comment on the marvelous scenery that charms one's eyes as he travels over the different parts of the Republic. It has been my privilege to view the best panoramas of the United States and Canada, of Switzerland, and the Himalayas in India, but I have never seen anything to equal the variety, grandeur, and exquisite beauty of the vistas of the Colombian Andes. When, by the construction of the Panama Canal and by favorable conditions of steamboat and railway travel, it will be possible for American tourists to go there with facility and comfort, Colombia will become one of the most-visited countries, both on account of the scenery and climate.

A THOUSAND MILES ON MULE BACK

Perhaps it is possible for me to speak on this matter with some authority because of the recent overland journey which I made, accompanied by Mr Mahlon C. Martin, a prominent American of Bogota, from the capital of Colombia via Quito to Guayaquil, Ecuador. Although the first object of this journey was to meet Mr Root on the west coast of South America, a secondary purpose was to study, and be able to report upon, an important section of South America never before traveled or visited by a North American official, but which will have a vast material and industrial development upon the opening of the Panama Canal.

We traveled in all 1,500 miles, of which 1,100 miles were on mule back. We spent 31 continuous days in the saddle and four days on railroads, in steamboats, and in automobiles. The details of this trip along the "ridge pole of the world" will be reserved for another address which your society has asked me to deliver.

HOW TO GET TO COLOMBIA

Naturally one of the first questions asked in regard to Colombia is how one gets there and how he reaches the capital. The regular route is as follows: One goes from New York to either Barranquilla or Cartagena, on the Caribbean coast. There are at present no steamers running direct to these places without stopping at other ports, but there are two or three lines, notably the Hamburg-American, with the Atlas service, and the Royal Mail, which touch *en route* south at Kingston, Jamaica, and either at Colon, Panama, or Port Limon, Costa Rica, as well as at Kingston, returning north. The trip usually requires, on account of stops, about nine days.

At Barranquilla the river steamer up the river can be taken, or, as some prefer, it is possible to go to Cartagena, and then by rail across to a town called Calamar, on the Magdalena river, where the river boat, in turn, is boarded. Many persons

visit Cartagena in order to see the city, as it is one of the most interesting, historically speaking, in all the Western Hemisphere. No other city in North or South America has such wonderful walls as those constructed in Cartagena by the Spaniards several centuries ago, at a cost of two or three hundred millions of dollars. They are still standing, in almost as good condition as when constructed. The journey up the river consumes from six to ten days, according to the condition of the river. Navigation stops at a town called La Dorada, where a short railroad carries the passenger to Honda. At Honda it is possible to transfer to an up-river, or smaller, steamer and proceed for a two days' journey to a town called Giradot, where begins the railroad that will eventually reach Bogota. At the present time this railroad reaches a point where there must be a mule-back ride of from seven to eight hours to Facatativa, the railroad station on the plateau of Bogota, which, after a run of thirty miles across the savanna, lands one in the capital.

The more common route, however, is that from Honda direct to Bogota, a distance of about eighty miles, or two and a half days' traveling on mule back. It is not as difficult as it would seem, and is interesting because of its novelty and the beautiful scenery. Mules can always be obtained in abundance to carry both passengers and baggage. Trunks and packages should not weigh altogether, for one mule, more than two hundred and fifty pounds, and should be arranged so that no one piece would weigh more than one hundred and twenty-five pounds. In this way two pieces of baggage are carried on one mule's back. Steamer trunks should always be taken instead of large, bulky ones. Heavy trunks and freight must be shipped up the river, to be landed at a point where they are carried by carts to Bogota. Honda is approximately 600 miles up the Magdalena River and Bogota is practically a 700-mile journey, requiring about two weeks' travel, from the seacoast. Women make the journey almost as frequently and easily as men, and there is no reason why American women wishing to go to that part of the world should not undertake the trip as well as men.

BOGOTA, THE CAPITAL OF COLOMBIA

Bogota, the capital of Colombia, is one of the most interesting cities in all Latin America. With a population of 125,000 and beautifully located on the edge of the plateau, in an excellent climate, it always proves an attractive place of residence. The social conditions are particularly pleasing. Nearly all the high-class people with whom one comes in contact live in beautiful homes, are well educated, have traveled abroad, and speak French as fluently as they do Spanish. There is a vigorous literary, artistic, and musical element, which exercises a favorable influence on the refined progress of the nation. There are excellent colleges and general schools. The clubs are centers where the cleverer men of the capital gather. There is opportunity for the enjoyment of sports, especially in such forms as tennis, polo, and riding horseback. Dinners and balls are given with an elegance that would be a credit to Washington or New York, while the women dress with as much taste and respect for the latest fashions as the women of our home capital. It is not possible for me to speak in too strong terms of the charming hospitality and kindness of association which I experienced during my stay in Bogota as United States Minister.

PRODUCTS OF COLOMBIAN SOIL

Considering now some tangible facts about the resources and possibilities of the country, it is well to note the principal products of Colombian soil. In the so-called "hot country" we find coffee, cocoa, sugar, tobacco, indigo, cacao, bananas, vanilla, corn, rice, beans, yucca, oranges, lemons, pineapples, alligator pears, and other tropical fruits growing in splendid abundance. Then in the forests are cedar and mahogany, dyewoods, vegetable ivory, Peruvian bark, rubber

trees, sarsaparilla, cocoa, ipecacuanha, gums, resins, and rare orchids. Cotton will grow readily in the open, but so far it is little cultivated, while on the warm uplands are cinchona, wax palms, balsam of tolu, vine of the cross, and the arisa in the forest, and corn, barley, wheat, potatoes, etc., in the plantations.

To describe further the products of the cooler plateaus of Colombia would simply be to name those of northern United States and Europe, but the oddity and advantage of it all to Colombia is that the hot and cold zones are in such remarkable and accessible proximity. We do not think of Colombia as a cattle country, but I have seen as fine beef on the hoof in both the hot and cold sections of the Republic as can be raised on our western plains. The day is not remote when Colombia will be supplying the New York market with meat, and it should supply the present and future demands of the Panama Canal Zone not only with beef, but with all other kinds of fresh natural products.

MINES AND MINERALS

Now let us note the ever-fascinating subject of minerals and mines. Colombia would be a rich country if dependent only on its agricultural and forest wealth, but it has a vast supply of minerals and precious stones that alone would make it a land of immense riches. If coal ever gives out in the United States, there is enough in Colombia to supply the world for centuries. It is found in many different parts of the Republic, including Cali, in the Cauca, on the Pacific, and also near the Atlantic coast, while there is so much soft, or bituminous, coal in the mountains around Bogota that the numerous mines running into their sides here and there remind one of giant gopher holes.

There are also indications of anthracite deposits which may rival those of Pennsylvania. So far, these have not been developed, because the natives do not understand or like hard coal.

Gold is mined in the States of Antioquia, Caldas, Tolima, and Santander in richly paying quantities, and *experts declare that some day there will be a "boom" here* like those of the Klondike, California, and South Africa. Silver is found in Antioquia, Cauca, and Tolima; copper in Boyaca; platinum in Cauca; petroleum in Tolima; while lime, alum, chalk, magnesia, sulphur, marble, asphalt, cinnabar, lead, and quicksilver ore are found in large deposits in many parts of the country.

At Pradera, not far from Bogota, iron and coal are side by side in such vast amounts that costly iron works have been erected, and it is now proposed to undertake the manufacture of steel by the Bessemer process.

Special mention should be made of the famous Musa mine, which provides the best and largest number of emeralds of any mine or mines in the world. It is one of the principal sources of income of the Republic, and as it is further developed it will be all the more valuable. Practically the only sure source of supply for the emerald demands of the world is the Musa mine. It is today one of the guarantees which the Colombian government uses for its credit abroad.

EXPORTS AND IMPORTS

Today Colombia is selling to the United States such exports as coffee, hides, alligator skins, goat skins, gold bars and dust, rubber, tobacco, and balsam of tolu, heron plumes and other feathers, straw hats, bananas, cocoanuts, chocolate, ivory nuts, quina, platinum, dyewoods, cedar, mahogany, orchids, etc. The value of these exports to the United States in 1905 approximated $6,300,000 in gold. This amount will be tripled when Colombia is started on an era of permanent peace and the national productiveness is accordingly increased.

Colombian imports from the United States include flour, kerosene oil, agricultural implements, mining and sugar refining machinery, railroad and steamboat

equipment, novelties of all kinds, shoes, matches, arms, sporting goods, hardware, dyes and chemicals, toilet articles, some lines of cotton cloth and clothing, paper and printing supplies, etc.; but, excepting the first of these items, the greatest quantities are supplied by Europe. Imports from the United States in 1905 amounted in value only to $3,700,000, although the grand total of foreign imports amounted approximately from $12,000,000 to $15,000,000.

FIELD FOR SPORTSMEN AND SCIENTISTS

The true American who loves sportsmanship and hunting for the exercise and rest, or the professional explorer and hunter who seeks new fields and prey, will find in Colombia unrivaled opportunities for pleasure or adventure. In the tropical and semi-tropical forests roam the jaguar, puma, bear, amarillo, tapir, peccary, sloth, deer, opossum, and cary. In the trees can be seen monkeys and a multitude of bird species, like condors, parrots, cockatoos, toucans, bush turkeys, or grouse, and humming birds. In the rivers are legions of alligators and iguanas, while along the coast there are numerous turtles. Cranes and storks fly over the damp lowlands and boa-constrictors crawl through the rank vegetation. In the higher and colder country are deer, foxes, mountain lions, and tigers, and along the lagoons and among the fields duck, snipe, and pigeons.

The geologist, mineralogist, botanist, forester, and average scientist, moreover, can always find abundant lines of study and investigation respectively in the geological formation, mineral deposits, flora and tree growth, and general physical characteristics of Colombia. In this connection it must be remembered that the great Humboldt found this part of South America the most interesting of his travels. The National Museum in Bogota contains rare specimens of fauna, flora, mineral and geological development which interest both the layman and the specialist.

GENERAL OBSERVATIONS

Before this discussion is at a close there are a few different points to which reference should be made. First, I desire to speak feelingly and in the highest terms of the President of Colombia, General Rafael Reyes. He undoubtedly stands out today as one of the foremost statesmen in all Latin America. Against heavy odds he is struggling bravely and manfully to evolve Colombia into a condition of permanent peace and prosperity. The terrible heritage that Colombia received from its last civil war, by which her land was reduced to a condition almost of poverty and more than one hundred thousand able-bodied heads of families were lost in battle, is a heavy handicap; but, if he keeps his health and is backed up by his people, he will be sure to place Colombia in the front rank of Latin America. Many criticisms are continually hurled at him by those who are not familiar with his high policies and with the obstacles that are in his path, but all those who have the best interests of Colombia at heart repose confidence in General Reyes' sincerity, ability, and patriotism.

Another point to bear in mind in connection with Colombia is the establishment of the Pan-American Railway connections. The great need of Colombia is railroads. It is interesting to note that many railroads are now in course of construction, and when these are completed they will do much for the progress of the country. One of the most important lines of approach from the coast to the interior is that from Buenaventura, on the Pacific coast, by the way of Cali and the Cauca Valley, and then on to the Medellin, the prosperous capital of Antioquia, which is being built by two Americans, Messrs Alfred Bishop and Edward Mason.

Finally, for the benefit of those who wish to study carefully the Republic of Colombia and form a broader idea of the country than this cursory talk has given them, I desire to call their attention to the

reports and pamphlets of the International Bureau of American Republics of this city, which is always doing its best to bring about closer acquaintance and relations between the United States and the Latin-American nations. It is also a pleasure to commend the excellent reports of the United States Consul General at Bogota, and the consuls at Barranquilla, Cartagena, and Cali, which are published in the "Commercial Relations of the United States" and the "Daily Consular and Trade Reports" issued by the Bureau of Manufactures, Department of Commerce and Labor.

PRESENT CONDITIONS IN CHINA

By Hon. John W. Foster

(*Continued from page 672*)

cities, of an abundant supply of pure water, introduced by the International Government. With these improvements there has come an intense activity in business. This renovation of the native Chinese cities must have a marked influence in strengthening the reform movement in all the departments to which I have referred.

CONDITION OF MANCHURIA

In one respect the country still suffers from the effects of the Russo-Japanese war. Manchuria continues to be held by the two belligerents, greatly to the injury of foreign trade, and especially of that of the United States. Until Chinese sovereignty is restored and custom-houses are re-established, foreign commerce, except that of Japan and Russia, is practically excluded from that vast region. The responsibility for this unsatisfactory condition seems to rest upon Russia. Soon after the war closed the Japanese government sent a special embassy to Peking, and a treaty was made adjusting all questions with China growing out of the war. The negotiations with Russia to the same end have not yet been concluded, owing, it is said, to the unreasonable demands of the latter; meanwhile foreign commerce suffers and the Chinese government is excluded from its sovereign rights in its own domain.

Dr Morrison, who has recently returned to Peking from a visit to Manchuria, reports as a result of his observations that Japan is faithfully fulfilling its obligations with regard to the withdrawal of troops and trade matters. During the last summer a commission of British and American merchants of Shanghai visited Manchuria to look into the trade conditions, and in their report they vindicated the Japanese government from purposely interfering with or placing any obstacles in the way of foreign commerce with that important part of the Chinese Empire. Chinese custom-houses are now being established at Dalny, Newchwang, and other southern ports; but so long as Russia holds possession of the northern section and allows the free import of Russian goods, other foreign countries will be placed at a disadvantage. At present the prospect is very unfavorable for the Chinese government to regain its control of the vast and productive province of Manchuria, the ancient home of its present dynasty.

INFLUENCE OF OTHER NATIONS

In the time allotted for this lecture it will not be possible to speak in any detail of the part already taken and to be

taken by foreign nations in the reforms and transformations in China which we have been considering. The greatest factor has been Japan, not so much through its direct interposition as by its example and achievements in its use of western methods. Its proximity and its ability to aid in the reforms, especially in education and in military development, are likely to make its people the most active foreign participants in the regeneration of China, although in some parts of the Empire there have been manifestations of hostility to Japanese activity in its affairs. It is to be borne in mind that whatever impress is given by Japan will be in the methods of western civilization, for it is through these she has grown powerful. I do not think that Japan or any other one foreign power is likely to exercise a dominating influence in Chinese affairs. The race has in the past ages demonstrated its cohesive power and its ability to maintain a distinctive nationality, and the reforms now in progress will tend to give it greater cohesion and independence.

It is gratifying to note that the government of the United States has always maintained toward China a disinterested friendship. The outcry against Chinese immigration has led Congress at times to harsh legislation, but our diplomatic relations with that country have ever been harmonious, and at times in critical periods our attitude has been most helpful to that Empire. This was notably the case during the Boxer troubles and at the outbreak of the Russo-Japanese war. Our commercial relations, for a few months only disturbed by the boycott, are destined to increase with the development of that country and the large number of new places opened to foreign trade. It is also pleasant to be assured that, notwithstanding the late rumors of hostility, the American missionaries are prosecuting their work with less opposition than ever before, and that they are being most useful in aiding in the great educational movement. The legation in Peking reports to the State Department that "the missionaries have every reason to be proud of their past record as educators in China, for although their influence has been indirect, the present movement owes very much more to them than appears upon the surface."

CONCLUDING COMMENTS

The work of reform upon which China has entered is a herculean one. Many well-informed foreign observers predict that the movement will break down and the reaction will bring the country back to its ancient conservative ways. There are no doubt many obstacles in the way of success. The Chinese are attempting to bring about in government and society in a very few years what it required centuries for the Anglo-Saxon and other European races to achieve. I have referred to the deliberation with which Japan emerged from her conservative ways and placed herself abreast of modern civilization.

But the very example of Japan makes it possible for China to accomplish the same task more speedily. It is said that the action of Japan in calling to her aid foreign experts in the different departments of reform should be followed by China. I think it would be wise for her to do so to a limited extent. But the situation is different today from that of Japan forty years ago. She had suffered few outrages at the hands of foreigners and felt little or no resentment toward them. Then none of her public men had been educated abroad, whereas China has thousands of subjects who have been educated in America and Europe in all departments and are well able to lead in the reform movement.

There is no doubt a spirit of unrest in the Empire which the anti-dynastic secret societies are fomenting, and the country is exposed to the dangers of revolt, which in the last century were so disastrous; but as the nation outlived them then, it is likely to do so again. Besides, there has been of late a marked manifestation of a spirit of patriotism. The last birth-

day of the Emperor, it is reported, was more generally observed and with greater heartiness than ever before. I have already spoken of the enthusiasm with which the announcement of a constitutional government has been received. The anti-American boycott, although ephemeral, was a surprising demonstration of popular spirit. The Shanghai riot, which startled the world, showed that the Chinese will no longer permit their rights to be invaded with impunity.

The Boxer indemnity is furnishing another evidence of popular feeling. This outrageous imposition, more than double the Japanese war indemnity, is a standing disgrace to the Christian nations—an exaction which Secretary Hay labored to avert and which it is understood he and President Roosevelt thought should no longer be enforced by our government at least. The indemnity was beyond the financial resources of the nation, but thus far the semi-annual installments have been promptly met. To do this, however, an appeal to the people was found necessary. This appeal was responded to by the imperial princes and high officials of Peking and by the officials of the whole country down to the eighth grade, who have agreed to contribute one-fifth of their salaries till the whole indemnity has been paid. Their example has been followed by the gentry and merchants, guilds, societies, Christian churches, primary schools, and all classes contributing liberally according to their means. The press recently reported the action of the barbers' guild of Peking resolving to contribute annually $600 and calling on like guilds throughout the Empire, which if responded to would yield alone a half a million of dollars. The barbers belong to one of the lowest classes in Chinese society, no son or descendant of which to the third generation can aspire to a literary degree or a public office; and yet they have come forward to show their patriotism and love of country in its hour of need. An American resident of Peking, describing this popular manifestation in the *Century* magazine, characterizes it as "one of the most remarkable movements the world has ever seen."*

In the light of these illustrations of Chinese patriotism, we may confidently express the hope that the day is not far distant when the reforms upon which this great people have entered may be in large measure realized; when education shall be generally diffused throughout the country; when the judicial system and the laws shall be made to conform more fully to those of the western nations; when the army shall be raised in numbers commensurate with the population and brought to the European standard of efficiency; when railroads shall bring the various provinces into direct communication with the capital and with each other and commerce shall have free development; when a constitution and representative government shall be established; when it shall be freed from the bondage of exterritoriality and exercise unrestrained control of its tariff; when the evil effects of opium shall be restricted, if not entirely removed; when the people shall have accepted the best features of modern civilization—then will the Chinese Empire be accorded and take its proper place in the family of nations.

That day I believe is not far away. When that day arrives there will be a new alignment among the great powers of the earth and new features introduced into politics and society, not for the hurt, I trust, but for the betterment of humanity. On that day we shall comprehend more fully the great truth proclaimed on Mars' Hill two thousand years ago, that "God hath made of one blood all nations of men to dwell on the face of the earth," and that all races are entitled to equal treatment in law and government.

*Dr. Griggs, in Century Magazine, July, 1906.

PROSPEROUS PORTO RICO

THE past several years have brought much happiness and prosperity to our little island in the West Indies. In an address to the National Geographical Society, November 10, the Treasurer of Porto Rico, Hon. William F. Willoughby, stated that the commerce of the island had doubled since 1901; the number of schools and of children at school had also doubled in the same period, and the health of the islanders had greatly improved, owing to discovery of Dr Bailey K. Ashford and Dr King of a means to cure them of tropical anemia, from which 90 per cent of the population had formerly suffered.

The exports from Porto Rico amount to $24,000,000 annually, of which $19,000,000 come to the United States. The imports amount to $22,000,000, of which $19,000,000 are from the United States. The trade with the United States is now nine times as great as in 1896. Sugar and tobacco are the principal exports, but coffee and citrus fruits are increasing more rapidly. Mr Willoughby believes that the Porto Rican coffee is the best coffee in the world, and that in a few years it will be in great demand.

The railroad mileage has about doubled since American occupation, and the island will soon have a belt line around its coast, over two-thirds being already completed. In five years the Americans have increased the mileage of macadamized roads one and a half times over what it took the Spaniards 400 years to build. Mules, traction engines, and automobiles have supplanted the oxen and carts. The trolley car has also been introduced.

In 1898 there were 539 schools in the island, with an attendance of 22,000. Last year this number had increased to 1,104, with 45,000 pupils. English is taught in all schools, and the Porto Ricans are all anxious to give their children a good education. Those who can afford it send them to the United States.

The climate is very healthful, there rarely ever being a case of yellow fever, with very little smallpox, typhoid, or malaria.

Perhaps the greatest achievement of the American control is the discovery of Drs Ashford and King, by means of which the people can be cured of tropical anemia. These gentlemen noticed that large numbers of the inhabitants were suffering from a wasting disease which weakened and ultimately destroyed them. They obtained from the legislature a grant of $5,000 to experiment; found that the wasting disease was caused by a parasitic worm in the intestines, and proceeded to devise a remedy.

Their grant was increased, and finally the work was made part of the public service, with an appropriation last year of $50,000, and stations have been established at convenient points throughout the island where the natives are treated free. The efficiency of the laboring population has been much improved by the work.

THE WELLMAN POLAR EXPEDITION

THE experiences of the past summer have strengthened Mr Walter Wellman's conviction that the air-ship is the only method of reaching the Pole, and that at present the dirigible balloon is the only feasible air-ship. The past summer he completed his base at Spitzbergen, which is to be his starting point, and has now between seven and eight hundred tons of supplies there. He has built in Spitzbergen the largest balloon-house in the world, 180 feet long, 82 feet broad, and 82 feet high. He has two hundred tons of sulphuric acid and eighty tons of iron filings ready to generate his hydrogen gas. During the winter months more powerful motors are being made for his air-ship, so that the total horse-power of the vessel will be 150.

Major Henry E. Hersey, of the United States Weather Bureau, who was appointed as the representative of the National Geographic Society last March, will go north with Mr Wellman again in the same capacity. Major Hersey, it will be remembered, accompanied Lieutenant Lahm in the recent long-distance balloon race from Paris to England, which was won by these two Americans, to the astonishment of France, which had a dozen entries.

HIGHEST CAMPS AND CLIMBS

BY EDWIN SWIFT BALCH.

In the summer of 1905, Dr T. G. Longstaff,* with the guides Alexis and Henri Brocherel, of Courmayeur, made a journey in which he explored several little known portions of the Himalaya, and also accomplished some remarkable feats of mountaineering.

On Nanda Devi he camped at 19,100 feet, and the next day climbed to 19,750 feet. On Nanda Kot he camped at 16,300 feet, and the day after ascended to about 21,000 feet.

Later he made a most determined attempt on Gurla Mandhata (25,350 feet), in southern Tibet. After a reconnaissance, through a mistake, on a lower peak (22,200 feet), he went up the western arête of Gurla to an altitude of about 23,000 feet, where they overlooked the 22,200-foot peak. Here the climbers started an avalanche and were carried down nearly 1,000 feet. At the spot to which they had fallen they spent the night. The next day they ascended the Gurla glacier to about 23,000 feet, where they spent the night in a hole in the snow; and the following day they climbed about 1,000 feet higher on Gurla, where they could not have been much below 24,000 feet. It is tolerably certain that this camp at 23,000 feet is the highest altitude at which men have ever had a "good rest," and that this topmost point attained on Gurla is probably the second highest altitude thus far reached.

Dr Longstaff's account is a piece of bald prose, and to a mountaineer should carry the conviction of his veracity. So far, he has escaped being attacked for having successfully carried out these wonderful feats of endurance, in which respect he has been more fortunate than his predecessor, Mr Graham.

Mr Graham† in 1883, with Herr Emil Boss, landlord of the Bär at Grindelwald and captain in the Swiss army, and Ulrich Kauffmann, a first-class guide from Grindelwald, made a journey in the Sikhim Himalaya, in which they reached about 22,700 feet on Dunagiri; ascended A 21, which they christened Mount Monal, 22,516 feet; ascended Jubonu, 21,300 feet; and finally ascended Kabru, which the Indian Survey triangulates as 24,015 feet high.

Mr Graham says: "We were off next morning at 4.30, and found at once all our work cut out for us. The very first thing was the worst. A long couloir like a half-funnel, crowned with rocks, had to be passed. The snow was lying loose, just ready to slide, and the greatest possible care had to be taken to avoid an avalanche. Then a steep ice-slope led us to a snow incline, and so to the foot of the true peak. Here we had nearly 1,000 feet of most delightful rock-work, forming a perfect staircase. At 10 we were at the top of this, and not more than 1,500 feet above was the eastern summit. A short halt for food and then came the tug of war. All this last slope is pure ice, at an angle of from 45 degrees to nearly 60 degrees. Owing to the heavy snow and the subsequent frost, it was coated three or four inches deep with frozen snow, and up this coating we cut. I am perfectly aware that it was a most hazardous proceeding, and in cold blood I should not try it again, but only in this state would the ascent have been possible in the time. Kauffmann led all the way, and at 12.15 we reached the lower summit of Kabru, at least 23,700 feet above the sea. The glories of the view were beyond all compare. * * * However, we had no long time for the view, for the actual summit was connected with ours by a short arête, and rose in about 300 feet of the steepest ice I have seen. We went at it, and after an hour and a half we reached our goal. The summit was cleft by three gashes, and into one of these we got. The absolute summit was little more than a pillar of ice, and rose at most 30 or 40 feet above us still, but, independently of the extreme difficulty and danger of attempting it, we had no time. A bottle was left at our highest point, and we descended."

Many attempts have been made to discredit Mr Graham's ascent of Kabru. These were principally done at the time by Anglo-Indians, who had had little or no experience of mountaineering. Their arguments have been refuted and the folly of most of their statements demonstrated by Mr Freshfield and other writers.* The account of Mr Graham reads clearly and truthfully and should carry conviction to any experienced mountaineer.

To any one who will look at the facts intelligently and without prejudice, there can be no doubt that Dr Longstaff has made the highest camp and the second highest ascent, and that to Mr Graham still belongs the coveted honor of the record ascent.

* T. G. Longstaff: "Six Months' Wandering in the Himalaya." *The Alpine Journal*, 1906, vol. XXIII, pp. 202–228.

†The most complete account of Mr Graham's trip is: W. W. Graham: "Travel and Ascents in the Himalaya." *The Alpine Journal*, 1884, vol. XII, pp. 25–52. Emil Boss and Douglas W. Freshfield: "Notes on the Himalaya and Himalayan Survey." *The Alpine Journal*, 1884, vol. XII, pp. 52–60.

* See Edwin Swift Balch: "The Highest Mountain Ascent." *Bulletin of the American Geographical Society*, 1904, vol. XXXVI, pp. 107–109.

DRAINAGE OF WET LANDS

Few people realize how valuable the topographic maps published by the U. S. Geological Survey may be in furnishing accurate data on which to base plans for improving swamps and marshes. On these sheets a general drainage plan may be laid down and the feasibility of the proposition definitely determined. There are many areas mapped by the Geological Survey in which enough information has already been collected to make a sub-

stantial beginning for studies in drainage. The really important marsh areas, such as the Dismal Swamp, the Florida Everglades, and the wide reaches in Minnesota, are yet to be mapped, and until that work is done no comprehensive plans for their drainage can be perfected.

NATIONAL GEOGRAPHIC SOCIETY

December 14—"Russia and the Duma." By Mr William E. Curtis. Illustrated.

December 15—Annual Banquet. The New Willard. The guests of the evening will include the Italian Ambassador; the Russian Ambassador and Baroness Rosen; the Japanese Ambassador and Vicountess Aoki; the Secretary of the Navy; Commander Robert E. Peary and Mrs Peary; Mr Morris K. Jesup, of New York, President of the Peary Arctic Club, and Mrs Jesup; Mr Herbert L. Bridgman, Secretary of the Peary Arctic Club; and Dr F. A. Cook, who has been the first to ascend Mount McKinley.

The special feature of the evening will be the first award of the National Geographic Society Gold Medal to Commander Peary.

December 21—"On Horseback through the Deserts of Lower California." By Mr E. W. Nelson, of the Bureau of Biological Survey. Illustrated.

January 2—"Between Egypt and the Promised Land: A recent journey into Moab and Edom." By Rev. Franklin E. Hoskins, D. D.

January 4—"German East Africa." By Dr Louis Livingstone Seaman, of New York. Illustrated.

January 18—"Camping Expeditions in the Canadian Rockies." By Mr Howard Du Bois.

January 25—"Bolivia—a Country Without a Debt." By the Bolivian Minister, Señor F. Calderon. Illustrated.

February 1—"The Rising Pacific Empire." By Hon. George C. Perkins, U. S. Senator from California.

February 8—"The Guianas." By Prof. Angelo Heilprin, of Yale University. Illustrated.

February 15—"Ten Years of Polar Work; or, What We Know and What We Want to Know." By Mr Herbert L. Bridgman, Secretary of the Peary Arctic Club. Illustrated.

February 19—"Two Thousand Miles in the Saddle through Colombia and Ecuador." By Hon. John Barrett, U. S. Minister to Colombia. Illustrated.

March 1—"Santo Domingo and Haiti." By Rear Admiral Chester, U. S. Navy. Illustrated.

March 15—"The Regeneration of Korea." By Mr George Kennan. Illustrated.

March 21—"Our Immigrants: Where They Come From, What They Are, and What They Do After They Get Here." By Hon. F. P. Sargent, Commissioner General of Immigration. Illustrated.

March 23—"Queer Methods of Travel in Curious Corners of the World." By Hon. O. P. Austin, Chief Bureau of Statistics. Illustrated.

March 29—"Mexico—the Treasure-house of the World." By Mr N. H. Darton, of the U. S. Geological Survey. Illustrated.

April 5—"A Popular Explanation of Earthquakes and Volcanoes." By Dr G. K. Gilbert, of the U. S. Geological Survey. Illustrated.

April 12—"Captain John Smith and Old Jamestown." By Mr. W. W. Ellsworth, Secretary of the Century Co.

Announcements will be made later of addresses by Commander Robert E. Peary, U. S. Navy, who has recently attained "Farthest North," and by Dr F. A. Cook, of Brooklyn, who has accomplished the first ascent of Mount McKinley, the highest mountain in North America.

SCIENTIFIC MEETINGS

The meetings of this course will be held at the home of the Society, Hubbard Memorial Hall, Sixteenth and M streets, at 8 p. m., on the following dates:

December 17—"Enterprising Siam." By Mr Henry S. Kerr, of New York, who has recently returned from that distant land. Illustrated.

February 28—"Acclimatizing Fishes — or Transplanting Fishes from the Atlantic to the Pacific, and Vice Versa, etc." By Dr Hugh M. Smith, Deputy Commissioner, Bureau of Fisheries. Illustrated.

January 11—Annual Meeting. "Aboriginal Agriculture in Guatemala." By Mr O. F. Cook, of the U. S. Department of Agriculture. Illustrated.

January 16—"The U. S. Forest Service." By Mr Gifford Pinchot, Forester. Illustrated. The Forest Service has charge of 114,606,058 acres of forest land, worth $400,000,000.

January 22—"The Coal Lands of the U. S. Public Domain." By Mr M. R. Campbell, of the U. S. Geological Survey. Illustrated.

February 9—"A Visit to Sumatra." By Mr George H. Peters, of the U. S. Naval Observatory. Illustrated.

February 18—"Reclaiming the Desert." By Mr C. J. Blanchard, of the U. S. Reclamation Service. Illustrated. The Reclamation Service has a fund of $40,000,000, which is being invested in irrigation works.

February 22—"Reclaiming the Swamp Lands of the United States." By Mr H. M. Wilson, of the U. S. Geological Survey. Illustrated.

March 8—"Twenty Years in Beirut and Damascus; or, The Syria of Today." By Rev. F. E. Hoskins. Illustrated.

March 22—"Utilizing the Surface Waters of the United States for Power." By Mr H. A. Pressey, C. E. Illustrated.

April 6—"The South Sea Islanders." By Mr A. B. Alexander, of the U. S. Bureau of Fisheries. Illustrated.

April 15—"Photographs of Wild Game Taken by Themselves." By Hon. George Shiras, 3d. Illustrated.

April 19—"A Trip to Argentine and Paraguay." By Mr John W. Titcomb, of the U. S. Bureau of Fisheries. Illustrated.

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(To Great Britain)
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Santa Clara
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Trinidad
Sancti Spiritus
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Cape Corrientes
Isle of Pines
Nueva Gerona
Jardines de la Reina
Jardinillos Bank
Dry Tortugas Reef
Pickle Bank
Great Bank of Buena Esperanza
Little Cayman
Cayman Brac
Grand Cayman
George Town
Old Isaac
Bodden
Cat Island
San Salvador or Watling I.
Long Island
Acklin Island
Crooked I.
Great Exuma Island
Exuma Sound
Conception I.
Rum Key
Hog Key
Flamingo Key
Man of War Channel
Jamaica Channel
Crooked Passage
Old Bahama Channel
Columbus Pt.
Bimini-ola Rocks
Great Bahama Bank
Tongue of the Ocean
Green Key
Yellow Key
Water Keys
Curly Cut Keys
Great Guana Key
Bitter Guana Key
Abaco I.
Hawk Channel
Fowey Rocks
Elbow Key
Sand Key
Carysfort Reef
Key Largo
Plantation Key
Islamorada
Matecumbe Key
Long Key
Grassy Key
Duck Key
Vaca Key
Boot Key
Knight Key
Pigeon Key
Bahia Honda Key
Big Pine Key
Sugarloaf Key
Cudjoe Key
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Big Coppitt Key
Boca Chica Key
Key West
Sombrero Key
Looe Key
Sand Key Light
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Alligator Reef
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Cape San Antonio
Point Maisi
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Point Frances
Point Corrientes
Point

CUBA

The Index letter and figure following the name refer to that point on the map at which lines, if drawn to connect the respective marginal letters upon either side and figures top and bottom of map, would cross each other at right angles.

Population figures are in accordance with Census of 1899. Railroad stations are indicated by *.

PROVINCES	Area Sq. M.	Pop.
Havana	(2,272	(24,811
Matanzas	(4,200	(87,839
Pinar del Rio	(4,660	173,082)
Camagucy	(10,587	88,207)
Santa Clara	(9,860	256,587)
Oriente	(14,000	527,716)
	50,000	1,200,000

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Ebow Key	B10
Enmedio Keys	C16
Fragoso Key	D12
Frances Key	D12
Galindo Key	C9
Grand Cayman	H12
Grande Key	E15
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Guinchos Key	D14
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Barbacoa	I29
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